NSW GOVERNMENT

NSW Infrastructure Digitalisation and Data Policy

Overview and Foundational Concepts Guide

Infrastructure NSW | September 2025

Acknowledgement of Country

Infrastructure NSW acknowledges the Traditional Custodians of the lands where we walk, work and live. We pay respect to their Elders past and present.

We acknowledge and respect their continuing connection to the 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 peoples' unique history of land and water management, and of art, culture and society, that began more than 65,000 years ago.

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Acknowledgement of Country II

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Glossary of terms

Term	Definition	Source / Author
2D CAD	2-Dimensional representation of an object or asset with associated geometrical information attached to it in a traditional drawing-based format, often referred as a 2D Computer Aided Design (CAD) drawing.	Infrastructure NSW
3D BIM	3-Dimensional solid object-based representation of an element or asset representing its geometrical (graphical) and non-geometrical (non-graphical) information.	Infrastructure NSW
Agency	Refers to NSW Government entities involved in the planning, delivery, construction, and operation and maintenance of state-funded public infrastructure.	Infrastructure NSW
Agency's Infrastructure Digitalisation and Data Policy (Agency IDD Policy)	An authoritative statement of the agency's commitment to effective infrastructure digitalisation and data management, as required under the NSW Infrastructure Digitalisation and Data Policy.	Infrastructure NSW
Agency's Infrastructure Digitalisation and Data Strategy and Implementation Plan	An agency's medium-term strategy and plan for implementing agency-wide infrastructure data and digitalisation actions over a 5-year time horizon, as required under the NSW Infrastructure Digitalisation and Data Policy.	Infrastructure NSW
Archive	Component of the common data environment (CDE) used to hold a journal of all information containers that have been shared and published during the information management process as well as an audit trail of their development.	ISO 19650-1:2018
Artificial Intelligence (AI)	A technical and scientific field devoted to the engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives.	ISO/IEC 22989:2022
As-built / works-as-executed (WAE)	Drawings or documentation that reflect the final work as built (or as executed) after construction and not the changes that have occurred during the design stages.	Infrastructure NSW
Assets	All non-financial assets recognised by the agency including, but not limited to, land and buildings, plant and equipment, infrastructure systems, leased assets, works in progress, cultural and heritage collections, ICT systems and digital services.	NSW Asset Management Policy (TPP9-07)

Term	Definition	Source / Author
Asset Data	Data that lists and describes an asset. Data supporting asset management decision-making. Asset data can exist in several formats such as structured data, documented information, sensor data, etc requiring different approaches to their management.	ISO 55013:2024
Asset Information Model (AIM)	Information model relating to the operational phase.	ISO 19650-1:2018
Asset Information Requirements (AIR)	Information requirements in relation to the operation of an asset.	ISO 19650-1:2018
Asset management	Asset management is the systematic process of coordinating a company's financial, risk, operational, and other asset-related entities to increase the value of its assets.	ISO 55000
Asset Management System	Management system for asset management whose function is to establish the asset management policy and asset management objectives.	ISO 55000
Attribute	A piece of data or information forming a partial description of an object or asset, or entity.	Infrastructure NSW
Building Information Modelling (BIM)	Use of a shared digital representation of a built asset to facilitate design, construction and operation processes to form a reliable basis for decisions.	ISO 19650-1:2018
BIM Model	3-Dimensional digital solid object-based representation of grouped assets represented by geometrical (graphical) information contained within a model. The BIM Model also contains non-geometrical (non-graphical) information. The BIM Models are typically developed for each discipline in native format.	Infrastructure NSW
Common data environment (CDE)	A CDE is an agreed source of information for any given project or asset for collecting, managing and disseminating each information container through a managed process.	ISO 19650-1:2018
Common data model (CDM)	A shared common data language for organisations to define how infrastructure data is structured, stored, and related within a common data environment. It provides a consistent framework for standardised, extensible infrastructure data schemas including entities, attributes, semantic metadata and relationships and must be integrated with the organisation's enterprise data model.	Infrastructure NSW
Data governance	The practice of implementing a set of policies, processes, structures, roles and responsibilities to ensure that an agency's data is managed effectively and that it can meet its current and future business requirements.	NSW AI Assessment Framework
Data management	Data management is the development, execution, and supervision of plans, policies, programs, and practices that deliver, control, protect, and enhance the value of data and information assets throughout their lifecycles.	Data Management Association (DAMA)

Term	Definition	Source / Author
Data schema	A detailed blueprint that specifies how data is related, i.e. how the infrastructure data is structured including defining the meaning of commonly used concepts, activities, and business data enabling consistency and interoperability across an organisation's systems and processes.	Infrastructure NSW
Data standards	Data standards provide a set of rules or guidelines to ensure data is consistently captured accurately and collated in the right format for the right purpose across different datasets.	Infrastructure NSW
Digitisation	Digitisation is the process of converting hard-copy, or other non-digital, records into a digital format, such as taking digital photographs of non-digital source records or imaging non-digital source records (also known as scanning).	ISO/TR 13028
Digitalisation	The development and application of digital and digitalised technologies that augment and dovetail with all other technologies and methods, causing fundamental changes in the connection of individuals and their behaviours as well as in the organisation of companies and their processes.	Global Forum on Maintenance & Asset Management (GFMAM)
Digital engineering (DE)	A collaborative way of working, using digital processes, to enable more productive methods of planning, designing, constructing, operating and maintaining assets.	National Digital Engineering Policy Principles
Digital thread	A framework or concept that typically refers to a seamless flow of data and information across the lifecycle of an asset, connecting various stages of design, construction, operation, and maintenance to enable informed decision-making, efficiency, and traceability.	Based on National Institute of Standards and Technology
Exchange Information Requirements (EIR)	Production, management and characteristic requirements for information to be submitted under a contract.	ISO 19650-1:2018
Geographic Information Systems (GIS)	A system to capture, store, manipulate, analyse, manage, and present all types of geographical data using geospatial mapping tools.	Infrastructure NSW
Information and Communications Technology (ICT)	The common term for the entire spectrum of technologies for information processing, including software, hardware, communications technologies and related services. In general, IT does not include embedded technologies that do not generate data for enterprise use such as stand-alone operational technology projects.	NSW Asset Management Policy (TPP9-07)
Infrastructure	For the purpose of the IDD Policy and this Guide, infrastructure is defined as asset infrastructure in the built environment. This includes the basic economic and social services, facilities and installations to support society including water, wastewater, transport (including road, rail, ports, airports etc), sport and culture, power, communications, digital and data, police and justice, health, education and family and community services and other NSW Government owned built infrastructure assets.	Infrastructure NSW

Term	Definition	Source / Author
Information Exchange	Structured collection of data or information at one phase or at a pre-defined stage of an infrastructure project with defined file format and fidelity.	Infrastructure NSW
Information Model	A data set comprising of specific information documentation, geometrical (graphical) and non-geometrical (non-graphical) data. Information Models are linked together using a common data structure (data schema) and asset classification system.	Infrastructure NSW
Industry Foundation Classes (IFC)	Industry Foundation Classes is a specification for open BIM to support an open standard for information exchange. Maintained by buildingSMART International.	buildingSMART International
Infrastructure Digitalisation	Infrastructure digitalisation refers to the use of digital practices, processes, technologies, and the associated data to optimise the planning, design, construction, operation, and disposal of infrastructure. This can include the use of digital tools such as building information modelling (BIM), digital twins, geographic information systems (GIS), artificial intelligence (AI), internet of things (IoT), and other smart technologies.	Infrastructure NSW
ISO 19650	ISO 19650 - Organisation and digitisation of information about buildings and civil engineering works, including building information modelling (BIM). The international standard for collaborative management of information over the whole life cycle of a built asset using BIM.	ISO International Organization for Standards
Level of Information Need (LOIN)	Framework which defines the extent and granularity of information.	ISO 19650-1:2018
Master data	Master data refers to the core, high-value, business-critical entities shared across an organisation and used in multiple business processes, applications, and systems.	Data Management Association (DAMA)
Maturity Assessment Tool (MAT)	A structured framework that evaluates an organisation's capabilities and processes concerning a specific domain (e.g. data management, digital transformation, or asset management). The tool provides a systematic way to assess current practices, identify gaps, and define a roadmap for improvement.	Infrastructure NSW
Metadata	Metadata is 'data about data'. It provides context, meaning, and structure for other data, making it easier to understand, use, and manage. It can be classified into different types of metadata, e.g. business, technical or operational metadata.	Data Management Association (DAMA)
Non-Geometrical (Non-Graphical) Information	Information that relates to the data stored or linked to BIM models.	ISO 19650-1:2018
NSW Infrastructure Digitalisation and Data Policy (the Policy)	Refers to the NSW Infrastructure Digitalisation and Data Policy which outlines the requirements for NSW Government agencies to apply infrastructure digitalisation and data management practices throughout the built infrastructure lifecycle.	Infrastructure NSW
Operational Technology	Operational technology is hardware and software that detects or causes a change, through the direct monitoring and/or control of industrial equipment, assets, processes and events.	NSW Government Digital NSW

Term	Definition	Source / Author
Organisational Information Requirements (OIR)	Data and information requirements to achieve the organisation's high-level strategic objectives.	ISO 19650-1:2018
Project Information Model (PIM)	Information model relating to the delivery phase.	ISO 19650-1:2018
Project Information Requirements (PIR)	Information requirements in relation to the delivery of an asset.	ISO 19650-1:2018
RASCI	RASCI stands for responsible, accountable, supportive, consulted, and informed. It's a framework that assigns specific roles and responsibilities to stakeholders involved in a project or process.	ISO 27001
Reference Data	Reference data is a subset of master data that is used to categorise or classify other data. It provides permissible values for a specific data field, and can contain code tables, taxonomies, and standardised values (e.g. industry classifications).	Data Management Association (DAMA)
'Shared'	The 'shared' areas of the CDE where the information is approved for sharing between the Appointed and the Appointing Parties.	ISO 19650-1:2018
Single source of truth	Expression describing the aim for information and data, which tends to be siloed and conflicting or wrong or out of date – this harms decision-making, and optimising value from assets.	Institute of Asset Management (IAM)
Stakeholders	Stakeholders include people or organisations that can affect, be affected by, or perceive themselves to be affected by a decision or activity of the agency including people and organisations both within and outside the NSW public sector.	NSW Asset Management Policy (TPP9-07)

Section 1

1 | About this guide

1.1 Purpose

The purpose of this Guide is to support NSW Government agencies in understanding the key concepts and requirements of the NSW Infrastructure Digitalisation and Data (IDD) Policy (the Policy).

It offers background context to the Policy and explains the foundational concepts and technical elements that underpin infrastructure digitalisation and data management practices which agencies are expected to understand and consider thereby ensuring effective implementation of the Policy.

Agencies must refer directly to the Policy for all mandatory **Actions** and **Requirements**. While this Guide is not intended to be prescriptive, it serves as an important supplementary resource for agencies to further understand the Policy's context and the intent of each of the mandatory **Actions** and **Requirements**. At the same time, agencies should have regard to their unique context and priorities to ensure Policy implementation remains fit-for-purpose. As stated in the Policy, to minimise administrative impact of implementation, agencies are encouraged to leverage existing processes, such as those found in project management and asset management, rather than creating new, separate processes.

The Policy and this Guide are intended for all stakeholders and practitioners involved in the planning, design, construction, and the operations & maintenance of built infrastructure assets.

1.2 Structure

IDD Policy Principles, Actions and Requirements

This Guide is framed around the **4 Principles** as outlined in the Policy, which are the foundational values and behaviours agencies are expected to adopt and apply across all aspects of the infrastructure lifecycle.

Agencies are required to apply these principles and implement the **13 mandatory Actions** of the Policy, which are the outputs or documents that agencies must produce to demonstrate compliance with the Policy. Each action is underpinned by **Minimum Requirements**, which stipulate what each **Action** must achieve, in terms of outcome, and how it should be carried out.

Table 1 — IDD Policy Principles, Actions and Requirements

Principle	Action
Principle 1: Commit to digitalisation to improve infrastructure delivery and asset management outcomes 	**Action 1.1** Agencies shall establish and maintain an Infrastructure Digitalisation and Data (IDD) Governance Structure.
	Requirement 1.1 The IDD Governance Structure shall oversee the development and implementation of the agency IDD Policy, Strategy and Implementation Plan. The governance structure shall include representatives from relevant functions of the organisation, including those responsible for managing each phase of the infrastructure asset lifecycle.
	Action 1.2 Agencies shall establish and maintain an Agency IDD Policy.
	Requirement 1.2 The Agency IDD Policy shall articulate the agency's commitment to infrastructure digitalisation and data management principles, practices, and outcomes in line with the Policy.
	Action 1.3 Agencies shall establish and maintain an IDD Strategy and Implementation Plan which identifies clear strategic objectives, outcomes, 5-year maturity targets, and planned initiatives to achieve them.
	Requirement 1.3a The IDD Strategy and Implementation Plan shall outline the strategic direction, initiatives, and timeline for the agency to achieve the outcomes and mandatory actions outlined within the Policy over a 5-year time horizon. **Requirement 1.3b** The IDD Strategy and Implementation Plan shall be endorsed by the agency executives, and its initiatives and activities approved via internal prioritisation processes.
	Action 1.4 Agencies shall conduct IDD maturity assessments to inform their IDD Strategy and Implementation Plan.
	Requirement 1.4a Agencies shall use the IDD Maturity Assessment Tool (to be developed by Infrastructure NSW) to assess the current level of infrastructure digitalisation and data management maturity levels across the organisation. **Requirement 1.4b** Agencies are to define a target maturity level in the Agency IDD Strategy, and develop their Implementation Plans accordingly to address the gap between the current and target maturity levels over the 5-year IDD Strategy time horizon.

Principle	Action
Principle 2: Prioritise the adoption, application, and enablement of digital practices, processes, and technologies 	**Action 2.1** Agencies shall develop, document, and maintain data and information requirements to enable infrastructure digitalisation outcomes.
	Requirement 2.1 Data and information requirements shall be established and documented in accordance with ISO 19650. These information requirements are to be clearly communicated to relevant parties and reflected in procurement to ensure there is clear understanding of information requirements and deliverables at different stages of the infrastructure lifecycle.
	Action 2.2 Agencies shall establish an Infrastructure common data model (CDM) to inform the development and operation of an Agency common data environment (CDE).
	Requirement 2.2 The CDM shall support the establishment of a CDE, which enables the creation of infrastructure data and flow of information, enabling sharing across the asset lifecycle. This includes establishing and maintaining interconnected technology platforms and environments to support different phases of the infrastructure lifecycle, supporting the management of the agreed single source of information for all infrastructure assets and associated activities under the agency's remit.
	Action 2.3 Agencies shall establish data standards to ensure a unified approach to information and data management across the portfolio and the infrastructure asset lifecycle and for all relevant disciplines.
	Requirement 2.3a Data standards shall be based on an appropriate classification system for master data, reference data and metadata to ensure a unified approach to infrastructure data management across the infrastructure lifecycle. **Requirement 2.3b** Agencies shall, as a matter of principle, adopt and use international best practice open data formats when developing their internal data standards. This applies to internal data standards relating to cost, schedule, survey, sustainability, geospatial, geotechnical, design, construction, and maintenance management. Data standards shall specify classification requirements, including for assets and locations, geospatial coordinates, naming conventions, file formats, and other relevant items. **Requirement 2.3c** Agencies are to ensure appropriate data security and cyber security measures are undertaken to safeguard infrastructure data across all phases of the infrastructure lifecycle. These measures must align with data and cyber security requirements outlined in relevant legislation, policy, standards and guidelines.

Principle	Action
Principle 3: Manage technology and data as an asset throughout the infrastructure lifecycle 	**Action 3.1** Agencies shall establish and maintain a CDE.
	Requirement 3.1 The CDE and data workflows shall be consistent with ISO 19650 requirements and shall be used for managing infrastructure data and information of the agency's infrastructure portfolio. The CDE shall be informed by the agency's Common Data Model. The agency may either adopt a single platform or a combination of local and cloud-based applications, with the ability to seamlessly collaborate, and share data and information between these applications. The agency CDE shall have the functionality to enable sharing of infrastructure data and information with internal and external stakeholders, including external delivery partners and other government agencies, where appropriate.
	Action 3.2 Agencies shall develop and implement an IDD Technology Plan to support their IDD Strategy and Implementation Plan.
	Requirement 3.2a The IDD Technology Plan shall identify technologies, tools and platforms to be used to support the agency IDD Strategy and Implementation Plan. It will facilitate the digital delivery of infrastructure and support ongoing operations and maintenance. These digital technologies, tools and platforms include AI, machine learning, modern construction methods (MMC), augmented and virtual reality (AR/VR), automation, robotics, and more. **Requirement 3.2b** Each solution within the IDD Technology Plan shall be appropriately assessed for cost, benefits, risks and impacts. This assessment will also consider interoperability with the CDE on data and cyber security, and scalability. Technologies should be managed as an asset and integrated into agency asset management practices.
	Action 3.3 Agencies shall reflect their information requirements and data standards in procurement processes and contracts to enable data sharing and information reliance.
	Requirement 3.3a Procurement processes shall be enabled by appropriate procurement frameworks, procedures, standards, and contracting templates that support the procurement of infrastructure data and information. These documents shall support procurement across all types of activities including planning, design, construction, operations and maintenance by addressing challenges such as data reliance. **Requirement 3.3b** Procurement processes and resulting contracts across the infrastructure lifecycle shall promote collaborative working arrangements, shared understanding of infrastructure data standards and governance, effective management of a CDE, and the adoption of suitable enabling technologies. **Requirement 3.3c** Tender evaluation criteria for infrastructure contracts shall adequately reflect the agency's data and information requirements. **Requirement 3.3d** Information requirements shall be provided to key stakeholders such as suppliers or delivery partners when they develop infrastructure data and information for the agency.

Principle	Action
	Action 3.4 Agencies shall document and formally agree on an IDD Operating Framework that outlines the organisation's approach to day-to-day activities, processes and decisions from an operational perspective.
	Requirement 3.4a The IDD Operating Framework shall outline and document the day-to-day activities, processes, decisions and requirements from an operational perspective to realise the agency's IDD Strategy and Implementation Plan. **Requirement 3.4b** The IDD Operating Framework shall have regard to existing policies, processes and functions of the organisation and integrate infrastructure digitalisation and data management practices where possible.
Principle 4: Invest in capability to advance infrastructure digitalisation 	**Action 4.1** Agencies shall identify critical roles and responsibilities to execute the IDD Strategy and Implementation Plan, and ensure these roles are filled.
	Requirement 4.1 Role descriptions for existing and new positions critical to supporting an agency's IDD Strategy and Implementation Plan shall be defined and maintained.
	Action 4.2 Agencies shall develop and execute an IDD Capability Uplift Plan to acquire, grow and retain the required skills and drive lasting change.
	Requirement 4.2a The IDD Capability Uplift Plan shall identify, agree, and commit to opportunities to improve the skills and capabilities of the workforce in line with the agency's IDD Policy and Strategy. Consideration should be given to new and existing internal skills and capabilities as well as options to leverage the expertise and resources across industry. **Requirement 4.2b** The IDD Capability Uplift Plan shall establish internal training or an awareness program to promote cross-functional alignment and understanding of the Agency's IDD Policy and Strategy. This program shall clearly define the roles and responsibilities of various functional areas to foster effective collaboration to support infrastructure digitalisation and data management practices. Key functions to include are the executive team, asset management, project delivery, maintenance, engineering, project controls, strategy, procurement, commercial, ICT, Operational Technology (OT), safety and any other relevant team.

Section 2

2 | Introduction to infrastructure digitalisation

This section provides an introductory overview of infrastructure digitalisation -what it is, benefits and opportunities from its application, the importance of working towards a 'digital thread' throughout the asset lifecycle, and key enablers of infrastructure digitalisation.

Many of the technical terms and concepts introduced in this section are defined in the glossary of terms, and explained in more detail in subsequent sections of this Guide.

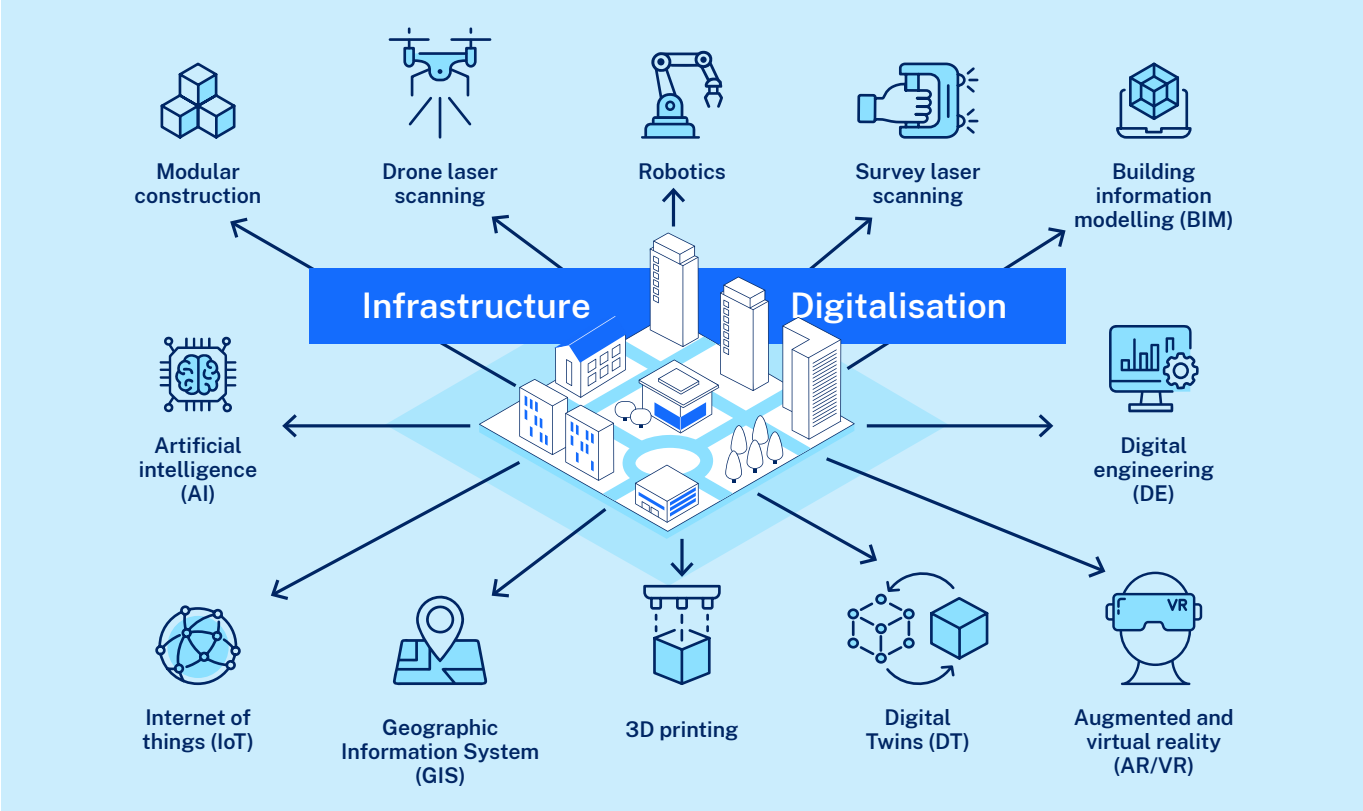
2.1 What is infrastructure digitalisation?

Infrastructure digitalisation refers to the use of digital practices, processes and technologies, and the associated data to optimise the planning, design, procurement, construction, operation, and decommissioning/disposal of infrastructure assets.

It encompasses the use of technologies and effective information management, which are essential for enhancing productivity, sustainability, social outcomes, and government services. The application of these practices and technologies enables greater efficiency, optimised materials and resource usage, and enhanced decision-making in the delivery and management of built infrastructure assets.

Examples of infrastructure digitalisation practices and technologies are shown in Figure 1.

Figure 1 — Various technologies, practices and processes that enable infrastructure digitalisation



Infrastructure digitalisation requires the conversion of traditionally analogue or manually driven processes into digital systems and formats. This includes the use of technology and digital data structures to create a '**digital thread**' of information throughout the asset lifecycle.

The digital thread is a concept that refers to seamless data integration and workflows throughout the asset lifecycle, which is fundamental to optimising infrastructure outcomes. For example, digital engineering, GIS and BIM enable the creation of detailed 3D models of buildings and infrastructure, while digital twins provide real-time digital replicas of physical assets, allowing for better monitoring and management. All of these rely on a digital thread of seamless and reliable data integration and workflows.

Robust information and data management is critical

Infrastructure digitalisation is only possible with **robust information and data management** – the systematic collection, storage, processing, and sharing of data generated at different stages of the infrastructure asset lifecycle.

Systematic and structured data management practices are essential for maintaining the integrity and usability of data throughout the asset lifecycle. This is enabled by defining and adopting fit-for-purpose data governance and data standards, ensuring data is interoperable across systems, and integrating infrastructure data workflows into the broader agency operating framework.

The use of open data formats and interoperable data standards supports the coordination between public and private sector stakeholders, fostering efficiency in project execution and long-term asset management.

In this regard, information (data) management is a critical element of infrastructure digitalisation. Managing technology and data as an 'asset' is one of the key principles of the Policy and is fundamental to unlocking the benefits associated with infrastructure digitalisation. Further guidance on best practice infrastructure data management is provided throughout this document.

2.2 What are the benefits and opportunities?

Enhancing infrastructure productivity through digital tools

Digital tools and technologies increase the productivity, efficiency, flexibility, and safety of physical infrastructure assets. As digital maturity grows, agencies can apply value engineering to optimise sustainability, therefore enhancing function-to-cost ratios and integrating advanced automation tools such as BIM and AI.[1]

For example, digital twins can test investment options and optimise workflows, while modern methods of construction (MMC) can reduce build time and unit costs. Early identification and resolution of issues through 3D models, visualisations, and reality capture technologies can help mitigate safety risks.

Strategic value for NSW Government

Digitalisation is a critical enabler for driving efficiency, sustainability, resilience, and national and global competitiveness of the NSW Government infrastructure program.

As a major client of the construction sector, the NSW Government is uniquely positioned to lead by example, promoting value-for-money, sustainable infrastructure delivery and technology-enabled asset management.

This leadership will accelerate sector-wide adoption of best practices in digitalisation and data management, ensuring public assets are optimised for performance, longevity, and public value.

Smarter decisions through reliable data

Digitalisation enhances the use of project and asset data across the infrastructure asset lifecycle, thereby boosting delivery efficiency and enabling informed decisions on carbon tracking, predictive maintenance, and operational resilience.

High-quality, data-driven insights support whole-of-life asset management, improving long-term outcomes for current assets and future investments. These practices also foster stakeholder collaboration, reduce rework, mitigate risks, and help identify more cost-effective and impactful investment options.

1 Khan, A.M., Alaloul, W.S. & Musarat, M.A. "A critical review of digital value engineering in building design towards automated construction" Environ Dev Sustain (2024)

Building Information Modelling (BIM) as a fundamental enabler

As a foundational component of the digital infrastructure ecosystem, BIM improves collaboration and enables rigorous and rapid coordination of design and construction compared to traditional 2D CAD or paper-based methods. This reduces errors, rework, and duplication, consequently delivering an estimated 20% increase in labour productivity.[2,3]

The European Union BIM Task Group in 2017 reported that the estimated financial opportunity for well-implemented digitalised engineering, construction and operations processes could be in the range of 10-20% of whole-of-life capital expenditure of infrastructure projects.[4]

BIM also enhances safety, with a Centre for Work Health & Safety Report in 2021 identifying it as a key contributor to improved workplace safety.[5]

Driving efficiency through accurate data management

The full value of digitalisation is realised when data is reliable, interoperable, and embedded as standard practice across the infrastructure asset lifecycle. This means:

- Data is accurately and consistently collected throughout the asset lifecycle.
- Agencies proactively manage and strategically leverage data to enhance decision-making.
- Data and information are interoperable across systems, stakeholders, and lifecycle phases.

Supporting sustainability and resilience through connected infrastructure

Digitally connected infrastructure enables smarter, faster responses to disruptions through proactive risk management. Real-time asset data improves decision-making and supports long-term portfolio planning by optimising maintenance and strengthening climate adaptation.

Achieving net-zero targets depends on accurate measurement, verification, and tracking of embodied carbon data. This requires high-quality, standardised data and digital systems that ensure transparency and comparability, empowering infrastructure projects to assess environmental impact, optimise material use, and accelerate decarbonisation.

2 F Leite, A Akcamete, B Akinci, G Atasoy and S Kiziltas, 'Analysis of Modelling Effort and Impact of Different Levels of Detail in Building Information Models', Automation in Construction, 2011, 20(5):601-608, doi: 10.1016/j.autcon.2010.11.027

3 W Lu, Y Peng, G Shen and H Li, Generic Model for Measuring Benefits of BIM as a Learning Tool in Construction Tasks, Journal of Construction Engineering and Management, 2013, 139(2):195-203, doi:10.1061/(ASCE)CO.1943-7862.0000585

4 European Union BIM Task Group. (2017). Handbook for the Introduction of Building Information Modelling by the European Public Sector. https://eubim.eu/handbook/

5 Centre for Work, Health & Safety. (2021). Health and safety management using building information modelling: Phase Three Report.

2.3 Importance of taking an asset lifecycle approach

The Policy applies across the entire lifecycle of infrastructure assets. To effectively embed digitalisation and associated data management practices, any digital process or technology must be implemented across all phases of the infrastructure project and the broader asset lifecycle.

The asset lifecycle includes all stages from the initial needs phase through to end-of-life activities such as disposal or decommissioning. Typical stages encompass concept development, planning, design, acquisition, delivery/construction, operations, maintenance, and eventual disposal. While terminology may vary across frameworks, the stages of infrastructure projects generally align with those of the asset lifecycle.

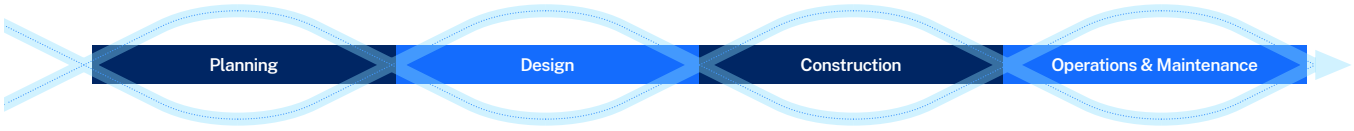
The 'digital thread' throughout the infrastructure lifecycle

Effective data management ensures that accurate and reliable data is available to the right people, at the right time, and in the right format for the intended purpose throughout each stage of the asset lifecycle.

As stated earlier, a 'digital thread' is a concept that typically refers to the seamless, integrated flow of structured and interoperable infrastructure data throughout all stages of the asset lifecycle from planning, design, construction, asset handover through to operation and maintenance, and finally decommissioning. The digital thread indicates how specific data types (datasets) and deliverables progress through the asset lifecycle from initial planning stage through to asset handover and how those deliverables change or develop through the design process and construction phase into a suitable asset data deliverable.

The digital thread also serves as the single source of truth for a given asset and/or project data deliverable, and ensures all stakeholders have access to consistent, accurate and up-to-date quality data. A visual representation (Figure 2) illustrates this alignment.

Figure 2 — Digital thread through the project lifecycle



Digital thread through-out the project stages | structured information & data in the right format at the right time for the right purpose

The digital thread is enabled by a common data environment (CDE) which typically refers to an organisation's digital platform or connected ecosystem of data environments with datasets that brings together and integrates project and asset data from multiple sources to provide a comprehensive, longitudinal view of an asset over time. This environment may include datasets related to existing site conditions, utility services, time, cost, carbon emissions, asset condition, inspection and test pit results, maintenance logs, environmental factors, and GIS datasets.

Datasets that form part of a CDE may be collected through various methods such as sensors, BIM models, GIS platforms, and field investigations. This information helps with tracking any changes to the assets and helps make informed decisions across the entire lifecycle of the infrastructure asset. The key opportunities enabled from a 'digital thread' throughout the infrastructure asset lifecycle are outlined in Figure 3.

However, establishing a seamless digital thread throughout the asset lifecycle requires an agency or organisation to establish a fit-for-purpose structured framework (i.e. an IDD Operating Framework as outlined in the next section). This is essential to enable agencies to leverage standardised, high-quality data to optimise asset performance, improve decision-making, and drive operational efficiencies.

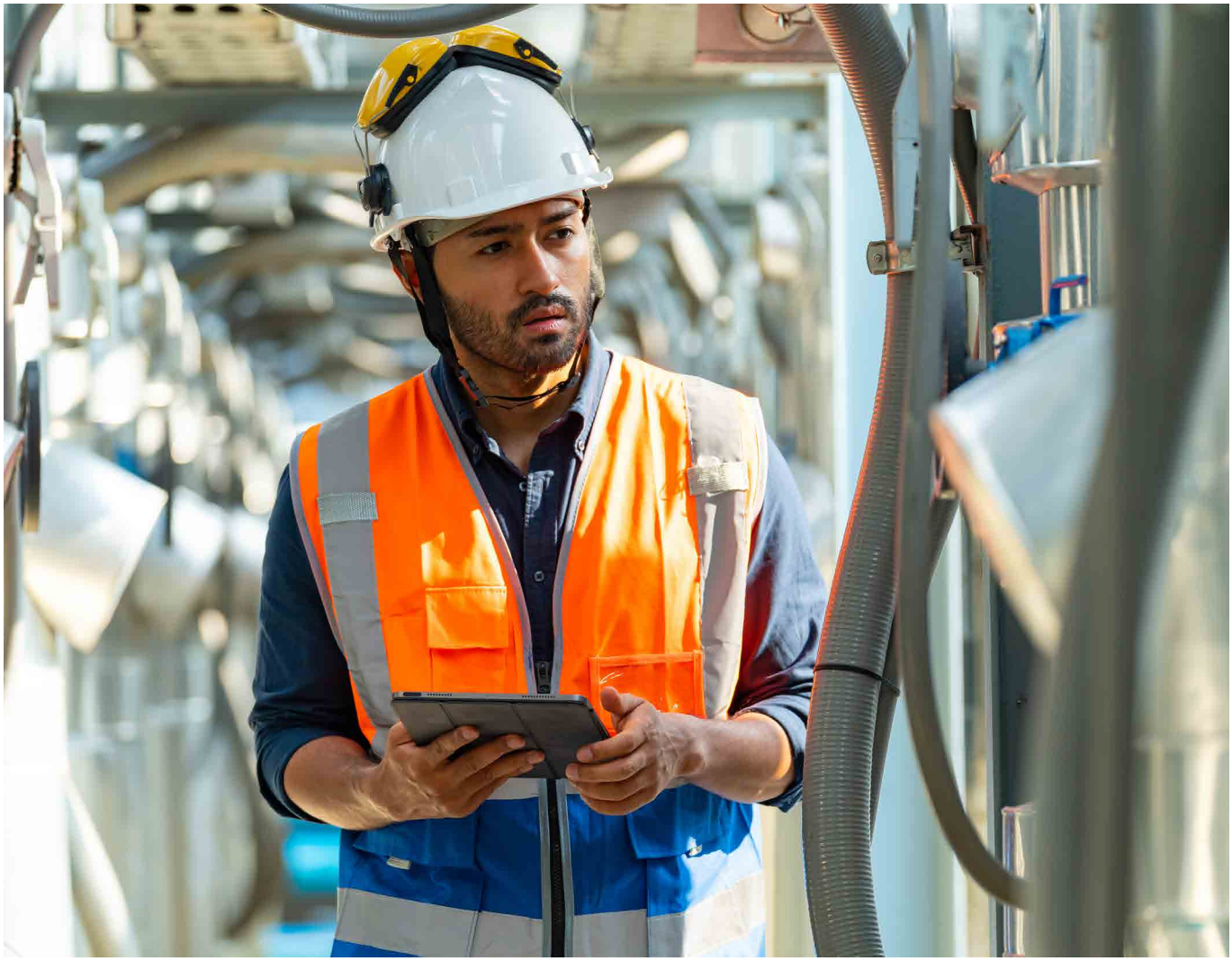


Figure 3 — 'Digital Thread': Applications & benefits across the infrastructure lifecycle

'Digital Thread'

Applications and benefits across the infrastructure lifecycle

Planning

Design

Construction

Overview of 'Digital Thread' Enabling Practices/Tools/Procedures

- **Digital capture of existing conditions** using technologies such as LiDAR, drones, reality capture and photogrammetry to generate accurate as-built models and geospatial data.
- **Integration of asset and geospatial databases** (e.g., GIS, digital asset registers) to provide a unified view of existing infrastructure, utilities, and environmental constraints.
- **Scenario planning and simulation tools** that allow planners to test design options, assess risks, and evaluate long-term impacts before committing to a preferred option.

- **Collaborative design platforms** (e.g., BIM, CDEs, Design Review technologies) that enable real-time access to design models and documentation for all project stakeholders.
- **Digital rule-based design systems** that encode engineering standards and automate compliance checks, ensuring consistency and quality in design outputs.
- **Structured data environments** that store, share and link design inputs such as material specifications, structural models, and energy simulations for downstream use.

- **Real-time progress tracking and validation** that link site progress to the design model, enabling continuous validation and deviation management.
- **Sensor-based quality assurance tools** that monitor materials, equipment, and environmental conditions to ensure compliance and safety.
- **Digital twin environments** that simulate construction sequences, identify potential clashes, and optimise buildability before physical execution.

Benefits

- Reduces reliance on assumptions by providing verified, high-fidelity data on existing site conditions and infrastructure.
- Improves the accuracy of early-stage cost and schedule estimates, reducing the risk of budget overruns and delays.
- Enables more informed, transparent, and collaborative decision-making among stakeholders.

- It ensures that the design is accessible in real time to all stakeholders, reducing design errors and improving decision-making.
- Enables reuse of design data in construction, operations, and maintenance, reducing duplication and improving lifecycle efficiency.
- Supports faster, more accurate design reviews by asset owners through automated validation and digital workflows.

- Improves transparency and accountability by providing a live, traceable record of construction progress and changes.
- Reduces rework and delays by enabling early detection of issues and deviations from the design.
- Enhances safety and quality outcomes through continuous monitoring and data-driven decision-making, ensuring quality and compliance.

Operations & Maintenance

Decommissioning

Overview of 'Digital Thread' Enabling Practices/Tools/Procedures

- **Live integration of IoT sensors and monitoring systems** to track asset performance in real time (e.g., structural health, temperature, geotechnical movements, vibration etc.).
- **Predictive maintenance platforms** that analyse historical and real-time data to forecast failures and optimise maintenance schedules.
- **3D as-built models and digital inspection tools** (e.g., laser scanning, photogrammetry) that support condition assessments and defect tracking.
- **Comprehensive digital asset records** that document the full lifecycle history, including materials used, modifications made, and performance data.
- **Simulation and scenario modelling tools** that support planning for asset retirement, repurposing, or refurbishment.
- **Sustainability and circular economy assessment tools** that evaluate the potential for material reuse, recycling, and environmental impact reduction.

Benefits

- Enables proactive maintenance strategies that extend asset life and reduce unplanned downtime.
- Improves operational efficiency by reducing manual inspections and enabling targeted interventions.
- Supports long-term asset management by maintaining a continuous, data-rich record of performance and interventions.
- Supports informed decision-making by providing a complete digital history of the asset's lifecycle and condition.
- Enables sustainable decommissioning strategies by identifying opportunities for material recovery and reuse.
- Reduces environmental and financial risks through data-driven planning and transparent documentation.

2.4 Working towards an organisational IDD Operating Framework

As part of Policy implementation, agencies must work towards establishing an internal IDD Operating Framework. A unified, organisation-wide operating framework that brings together various components (i.e. requirements, practices, standards and processes) that together articulates how infrastructure digitalisation and data management practices are to be embedded across the agency's infrastructure delivery and asset management activities.

This should include bringing together components such as data governance, information requirements, data standards and data management, procurement practices, internal assurance mechanisms, asset management and technology plans referenced into a single and overarching centrally documented framework. Its purpose is to ensure consistency, clarity, and should be coordinated across all functions and stakeholders involved in infrastructure delivery and asset management within an agency.

The IDD Operating Framework must reflect and leverage the agency's operating frameworks, which defines the roles and responsibilities of internal and external stakeholders and maps the flow of data and information across planning, design, procurement, construction, operations and maintenance. While agencies may tailor their operating framework based on outsourcing services or delivery model structures, the IDD Operating Framework should provide a common reference point that ensures alignment and interoperability of data and information.

By integrating this framework into their business-as-usual operations, agencies can:

- standardise data management and information requirements across the asset lifecycle
- embed digital and data considerations into contracts and procurement processes
- enable cross-functional collaboration between project delivery, operational and asset assurance teams
- facilitate whole-of-government decision-making by enabling consistent and reliable data interoperability.

The success of this enterprise-wide operating model approach will depend on how well agencies implement foundational concepts such as the 'digital thread', information and data management, common data models and common data environments. The framework must also be adaptable to existing organisational policies, practices and procedures, ensuring it enhances rather than duplicates existing functions.

Agencies should refer to **Section 5.5** of this Guide, which outlines the core components that an IDD Operating Framework should contain. These include the operational processes, governance structures, information and data requirements, and implementation mechanisms necessary to establish the agency's IDD Strategy and Implementation Plan.

Ultimately, the IDD Operating Framework is a critical enabler of infrastructure digitalisation and data management. It provides the structure and clarity needed to operationalise the IDD Strategy and Implementation Plan, ensuring that digital and data practices are not siloed but embedded across the organisation's core business functions.

2.5 Key enablers of infrastructure digitalisation

The Policy identifies **7 key enablers** of infrastructure digitalisation that are fundamental to achieving effective and sustained infrastructure digitalisation for agencies within the scope of the Policy. Table 2 describes each enabler and its importance for achieving infrastructure digitalisation.

All mandatory **Actions** of the **Policy** have been designed to align to at least one of the 7 enablers.

Table 2 — 7 key enablers of infrastructure digitalisation

Enabler	Description	Why this is important
Governance and frameworks 	This enabler refers to the establishment of fit-for-purpose governance and frameworks at the organisational level. Governance and frameworks provide the structure, discipline, authorising environments and accountabilities through which the organisation's infrastructure digitalisation activities are delivered. It ensures digitalisation initiatives are aligned to strategic objectives of the organisation and remain value-driven by having regard to all relevant business functions and disciplines involved in infrastructure delivery and asset management.	Well-governed and maintained frameworks enable organisations to progressively and effectively manage infrastructure digitalisation efforts. It ensures that digital practices are integrated across the infrastructure asset lifecycle, supports better decision-making, and drives improved performance and outcomes. It also helps mitigate any risks, promotes data integrity, and foster collaboration across agency teams.
Information requirements 	This enabler refers to the clear documentation and definition of an organisation's data and information needs across the infrastructure asset lifecycle. This includes specifying what information is required for each deliverable and dataset, establishing methodologies for how that data is exchanged and shared. Requirements should align with ISO 19650 best practices to ensure consistency, interoperability, and clarity in digital information management.	Clear and standardised data and information requirements are critical to supporting governance and decision-making throughout the infrastructure lifecycle. They ensure that the right data is available at the right time, enabling informed decisions, reducing risk, and improving efficiency. Alignment with ISO 19650, enhances collaboration across disciplines, and supports the delivery of high-quality infrastructure asset outcomes.
Data standards 	This enabler refers to the establishment of consistent, organisation-wide infrastructure data standards and governance practices. These standards define how data is created, federated, verified, analysed, and reused across the infrastructure asset lifecycle. It also ensures alignment with elements such as common data models and common data environments, supporting data interoperability and clarity in how information requirements are met and managed.	Robust data standards and governance are essential for enabling reliable and efficient use of infrastructure asset data across projects and organisational functions. They support informed decision-making, reduce duplication and errors, and facilitate data sharing and reuse. For example, by aligning with common data models and environments, organisations can ensure consistency, improve collaboration, and enhanced data fidelity and quality.

Enabler	Description	Why this is important
Common data environment (CDE) 	This enabler refers to a group of integrated platforms and workflows within an organisation that enable users to collect, store, collaborate, share and exchange infrastructure data and information. A CDE and its associated workflows ensure that all stakeholders involved in infrastructure delivery and management have timely access to accurate and relevant information about the organisation's infrastructure asset portfolio. This includes establishing and maintaining an ecosystem of connected data environments to support data and information management across the entire infrastructure asset lifecycle.	A well-structured CDE is critical for enabling consistent, secure, and efficient information flows across infrastructure projects. It ensures that stakeholders, from planning through to operations, can access the right data at the right time, thus reducing duplication, improving collaboration, and supporting informed decision-making. By maintaining a connected ecosystem of data environments, organisations can enhance transparency, streamline workflows, and optimise infrastructure outcomes across the asset lifecycle.
Technology 	This enabler refers to the use of digital tools, platforms, and systems that support infrastructure planning, delivery, and asset management. These technologies enable organisations to enhance decision-making, streamline operations, and foster collaboration across stakeholders. They are applied across the infrastructure portfolio to improve data accessibility, automate workflows, and support integrated digital practices.	Digital technologies are essential for transforming how infrastructure is delivered and managed. They improve operational efficiency, enable real-time insights, and support evidence-based decision-making. By increasing stakeholder engagement and collaboration, these tools help organisations respond more effectively to challenges, optimise asset performance, and achieve better infrastructure outcomes.
Procurement and contracting 	This enabler refers to the practices and processes that ensure an organisation's infrastructure data and information requirements are appropriately delivered by service providers through procurement and commercial contracts. This includes adapting existing procurement and contractual frameworks to clearly define the expectations and requirements for data and information and associated digital practices by service delivery partners.	Effective procurement and contracting are essential to securing infrastructure asset data and services that represent best value for money and meet the organisation's current and future needs. By embedding clear data and information requirements and aligning contracts with the Policy's objectives, organisations can ensure consistency, accountability, and quality of infrastructure data throughout service delivery.

Enabler	Description	Why this is important
Capability 	This enabler refers to the ongoing development of an organisation's infrastructure digitalisation and data skills and resources. This includes investing in internal capabilities, such as staff training, upskilling, and organisational structuring, as well as leveraging subject matter expertise and resources available across the organisation and through service delivery partners.	Building and maintaining digital capability is essential for organisations to continuously improve their infrastructure digitalisation practices. It supports resilience, adaptability, and readiness for future infrastructure asset delivery needs. By investing in digital capability uplift, organisations can enhance performance, foster innovation, and ensure they deliver high-quality infrastructure asset outcomes.

Infrastructure digitalisation and transformation is not a simple undertaking. It is complex and its progress will be incremental, involving multiple organisational functions, disciplines and stakeholders to work together. Achieving the Policy's objectives requires effective change management, with strong leadership, and a sustained commitment to achieving digitalisation change. Building internal capability and skills requires effective collaboration across these **7 key enablers** to ensure robust infrastructure digitalisation change and transformation.

Section 3

3 | Implementation Guidance: Actions under Principle 1

3.1 Overview

Principle 1

Commit to digitalisation to improve infrastructure delivery and asset management outcomes.

This principle emphasises the importance of establishing clear accountability, roles and responsibilities, so that infrastructure digitalisation is embraced at all levels of an organisation. Mandatory **Actions** under this **Principle** requires agencies to set up a fit-for-purpose governance structure, establish an Agency IDD Policy, and develop and adopt a 5-year agency IDD Strategy and Implementation Plan to ensure progressive adoption of digitalisation practices throughout its infrastructure delivery and asset management programs.

Mandatory Actions under Principle 1 include:

- **Action 1.1** Agencies shall establish and maintain an IDD Governance Structure.

  A robust governance structure is the backbone for effective infrastructure digitalisation. Agencies must establish appropriate governance processes and/or utilise existing governance where appropriate to ensure there is effective oversight of the agency's progress in meeting Policy compliance.

- **Action 1.2** Agencies shall establish and maintain an Agency IDD Policy.

  Adopting an Agency-level IDD Policy is fundamental to ensure expectations and requirements related to infrastructure digitalisation and data management are clearly established and made available across the entire organisation. This Policy serves as a foundation for how agencies plan, deliver and manage infrastructure projects and assets' blueprint for managing infrastructure data and tools within the agency.

- **Action 1.3** Agencies shall establish and maintain an IDD Strategy and Implementation Plan which identifies clear strategic objectives, outcomes, 5-year maturity targets, and planned initiatives to achieve them.

  The IDD Strategy and Implementation Plan is essential for outlining the agency's digital goals and milestones. It should detail the strategic objectives, desired outcomes, and the steps needed to achieve these targets within specified timeframes.

- **Action 1.4** Agencies shall conduct IDD Maturity Assessments to inform their IDD Strategy and Implementation Plan.

  Conducting regular IDD Maturity Assessments helps agencies to gauge their progress in digitalisation. These assessments provide insights that are critical for refining the IDD Strategy and Implementation Plan, ensuring continuous improvement and alignment with the agency's goals.

3.2 Setting up an appropriate governance structure

As stated under **Action 1.1** and **Requirement 1.1**, agencies are required to establish a governance structure to support the development and implementation of the Agency-level IDD Policy, Strategy and Implementation Plan, and to oversee progressive implementation of the mandatory **Actions** of the Policy. In establishing the governance, appropriate representation from relevant functions from across the organisation must be considered.

Appropriate governance is critical to ensure fit-for-purpose oversight, with clear delineation of responsibilities, and robust coordination across the agency. All of which is essential for successful integration of digital practices and technologies across the agency's infrastructure delivery and asset management processes.

Representation in governance

To ensure the successful implementation of the IDD Policy and subsequent **Principles, Actions** and **Requirements**, it is essential for the agency to establish and clearly define leadership roles within a fit-for-purpose governance framework.

During the Policy's initial 18-month transition period, governance arrangements should distinguish between:

- immediate implementation governance, focused on compliance with the mandatory IDD Policy **Actions** and **Requirements**
- longer-term transformation governance, designed to evolve with the agency's digital maturity and strategic ambitions over time.

Agencies should therefore plan for a phased approach:

- Establish core governance to guide adoption and implementation of the IDD Policy.
- At an appropriate time, design broader governance frameworks that will support ongoing maturity and capability uplift.

This approach ensures governance remains responsive, effective, and aligned with the agency's evolving digital maturity. The following outlines a few of the key roles and groups that should be considered initially within the 18-months transition period, which can then scale to meet the wider implementation requirements of the Policy over time.

Key governance roles and groups

Executive level

Executive leadership must hold overall accountability for the agency's digital and data capabilities across all stages of the asset lifecycle. Their role is pivotal in setting the strategic direction and ensuring that digitalisation is embedded as a core agency organisational priority.

This includes developing, implementing, and maintaining the Agency's IDD Policy, ensuring alignment with broader NSW government objectives, and promoting a culture the supports digitalisation and continuous improvement within the agency.

Roles and responsibilities of the executive group include:

- **Endorsement and oversight:** Approving and overseeing the development and implementation of the Agency IDD Policy and 5-year Strategy and Implementation Plan.
- **Strategic alignment:** Ensuring that digitalisation efforts align with organisational objectives and broader whole-of-government objectives.
- **Culture and capability:** Fostering a culture of collaboration, innovation, continuous improvement, and digital enablement across the agency.
- **Governance integration:** Ensuring governance structures have regard to the 7 key enablers of infrastructure digitalisation.
- **Accountability and leadership:** Providing visible leadership and accountability for the implementation of the IDD Policy, especially during the 18-month transition period.

Steering Committee

Agencies should consider establishing an infrastructure digitalisation steering committee as part of its governance structure. The committee's role is to provide strategic oversight, ensure cross-functional collaboration, and monitor policy implementation and compliance. This committee, led by the appropriate executive level leadership, should comprise senior representatives from key functional areas such as, but not limited to:

- **Project planning and delivery:** To embed digital practices into planning, design, and construction workflows.
- **Asset Management:** To ensure digitalisation leads to enhanced asset outcomes by integrating digitalisation practices and processes with the organisation's asset management framework.
- **Information Technology (IT):** To oversee technology infrastructure, interoperability, and cyber security.
- **Data governance:** To ensure robust data management, standards, and compliance with ISO 19650 and other frameworks.
- **Corporate Services:** To facilitate the integration of digital practices into day-to-day operational practices through the development and release of internal policies, guidelines and handbooks.

Considerations for an IDD Governance Structure

A robust IDD governance framework should incorporate several essential elements to provide effective oversight and promote accountability as outlined in Table 3.

Table 3 outlines key elements for an IDD governance structure agencies should have regard to. These components lay a solid foundation for consistent decision-making, risk management, and strategic alignment throughout the organisation.

Table 3 — IDD Governance Structure Elements

Governance elements	
Leadership and accountability	• Clearly defined roles and responsibilities for leaders, directors and managers at various levels within the agency to ensure accountability for digitalisation initiatives. • Establishing a clear leadership structure that can drive and oversee the digitalisation process, ensuring that each leader understands their role in achieving the agency's objectives.
Strategic alignment	• Mechanisms to align digitalisation efforts with the agency's long-term strategic objectives whilst enhancing the overall effectiveness of infrastructure asset management. • Integrating digital strategies with the agency's overall mission and goals, ensuring that all digital initiatives are aimed at achieving these long-term objectives.
Policy and standardisation	• Development and enforcement of policies and standards that govern data management practices and the use of digital technologies across the agency. • These policies should be designed to ensure consistency and compliance with industry best practices and regulatory requirements, thereby providing a framework for effective digitalisation.
Performance monitoring	• Regular monitoring and reporting processes to track the progress of digitalisation initiatives and ensure continuous improvement. • Establishing benchmarks and key performance indicators (KPIs) to measure the success of digitalisation efforts and identify areas for improvement.

Governance elements	
Stakeholder engagement	• Active involvement of relevant stakeholders to foster collaboration and support for digitalisation efforts. • Engaging stakeholders from various agencies and departments to ensure a holistic approach to digitalisation, facilitating cooperation and coordination among all parties involved.
Risk management	• Identification and mitigation of risks associated with implementing digitalisation. • Developing strategies to address potential challenges and obstacles, ensuring that the digitalisation process can proceed smoothly and without disruption.
Training and development	• Providing ongoing education and training to staff to ensure they are equipped with the necessary skills and knowledge to support digitalisation initiatives. • Offering workshops, certifications, and other learning and development opportunities (i.e. further qualifications) to keep staff updated on the latest digital technologies, tools, practices, knowledge and capabilities.
Technology infrastructure	• Ensuring that the agency has the necessary technological infrastructure to support digitalisation. • Investing in hardware, software, cyber security and other digital tools that can facilitate the integration of digital tools and technologies into infrastructure delivery.

It is imperative that agencies invest in developing and maintaining robust governance frameworks to drive their digital transformation and achieve sustainable outcomes in infrastructure asset delivery.

The governance structure should promote transparency and accountability by enabling clear communication channels and decision-making processes. This ensures that all stakeholders are fully informed about the digitalisation initiatives and their progress within all parts of the agency.

Additionally, the governance structure must be adaptable to evolving technological advancements and external changes and pressures. Agencies should regularly review and update their governance frameworks to incorporate emerging best practices, technological advancements, and any regulatory changes.

3.3 Agency-level IDD Policy

As stipulated under **Action 1.2** and **Requirement 1.2**, agencies are required to establish and maintain an Agency-level IDD Policy, which serves to articulate the agencies commitment to the Policy and the **Principles, Actions** and **Requirements** it outlines.

This would be specific to an agency's infrastructure digitalisation objectives, principles and overall expectations for how the organisation and its employees are to approach infrastructure digitalisation. This Policy should have close alignment with the agency's asset management policy (as required under the NSW Asset Management Policy (TPP19-07)). Agencies are also encouraged to consider referring to other relevant international standards for infrastructure information management such as ISO 19650 – Information Management utilising Building Information Modelling (BIM) in the Agency's IDD Policy.

The Agency IDD Policy is an authoritative statement of the agency leadership's commitment to effective infrastructure digitalisation management, including setting the direction for the agency's activities as they relate to infrastructure digitalisation and data management.

It should be designed to align all agency divisions (i.e. organisational sub-sets of an agency) and individuals who work within and interact with the agency to a clear and common set of infrastructure digitalisation goals.

From an NSW public sector perspective, an Agency-level IDD Policy represents the commitment of the agency to embrace infrastructure digitalisation as a concept and to establish, maintain and improve the agency's infrastructure digitalisation framework.

The **Agency's IDD Policy** should:

- outline the principles that underpin effective infrastructure data management and infrastructure digitalisation practices in the agency (consistent with the IDD **Principles** outlined in the Policy)
- be aligned with relevant existing NSW Government policies such as asset management, data and information management, cyber security and data security etc
- demonstrate a commitment to the NSW Government and the agency's priorities through effective infrastructure digitalisation and data management
- recognise the agency's organisational context
- support and enable the organisation's purpose and objectives
- outline key roles, responsibilities and accountabilities for monitoring policy compliance
- include a commitment to continuous improvement of the agency's IDD Strategy and Implementation Plan and broader data and digitalisation maturity levels
- be approved and endorsed by the appropriate senior executive/s (group) of the agency.

3.4 Agency-level 5-year IDD Strategy and Implementation Plan

The **IDD Strategy and Implementation Plan** is a foundational requirement under **Action 1.3** of the Policy. It is designed to guide agencies in embedding digital and data capabilities across the infrastructure asset lifecycle, aligned with broader government objectives and agency-specific operational contexts.

3.4.1 Driving strategic alignment and progressive maturity

As defined by **Requirement 1.3a and 1.3b**, the Agency IDD Strategy and Implementation Plan will articulate key initiatives, tasks and activities needed to achieve outcomes consistent with the Policy over a 2 to 5-year horizon. The strategy should be informed by an assessment of the agency's current IDD maturity levels, and the target level of maturity it is working towards. It will be endorsed by the agency's senior executives, and its initiatives and activities approved via internal prioritisation processes. Agencies can utilise the IDD Maturity Assessment Tool (IDD MAT) for assessing current maturity levels and determining appropriate maturity targets to inform their IDD Strategy and Implementation plans.

The Agency IDD Strategy and Implementation Plan may be a single document or may comprise multiple documents depending on the scope and complexity of the agency.

Furthermore, the agency may choose to create a stand-alone Agency IDD Strategy and Implementation Plan or incorporate it into the agency's Strategic Asset Management Plan (SAMP), provided they can demonstrate compliance with the requirements of the Policy. It should reflect the agency's commitment to delivering improved infrastructure outcomes through digitalisation, consistent with the Asset Management Policy and aligned with ISO 19650 principles.

Key Components

The 5-year Strategy and Implementation Plan must include the following:

1. **Strategic objectives and outcomes:** These should articulate how digitalisation and data management will support the agency's mission, improve infrastructure performance, and deliver public value. Objectives must be measurable and time-bound and should reflect both internal priorities and whole-of-government expectations. This includes consideration to asset management outcomes consistent with the Asset Management Policy.
2. **Current maturity assessment:** Agencies must assess their current state using the IDD Maturity Assessment Tool (IDD MAT). This includes evaluating digitalisation and information and data enablers, systems, practices, and workforce capabilities. The assessment should be evidence-based and tailored to the agency's size, complexity, and its infrastructure asset portfolio.
3. **Target maturity and gap analysis:** Agencies must define a target maturity level over a 5-year horizon and identify the gaps between current and desired future state. This analysis should inform the prioritisation of initiatives and resource allocation for IDD implementation.
4. **Priority actions and initiatives:** The Strategy and Implementation Plan must outline a sequenced roadmap of actions to close maturity gaps, some of which may broadly align with other mandatory **Actions** of the IDD Policy. These may include:
    - establishing and implementing clear information requirements and data standards
    - implementing data governance frameworks
    - establishing or enhancing a common data model and a common data environment
    - investing in BIM, digital engineering and other digital collaboration capabilities
    - upskilling staff in digital tools, technologies and practices.
5. **Implementation approach**: This includes governance structures, stakeholder engagement, change management, and resourcing. The Strategy and Implementation Plan must be endorsed by agency executives and integrated into internal prioritisation and investment processes.
6. **Monitoring and review:** Agencies must define how progress will be tracked, including KPIs, reporting cycles, and mechanisms for continuous improvement. This ensures the Strategy and Implementation Plan remain responsive to evolving needs and technologies.

3.4.2 Assessing current state of maturity

As an input into the Agency's IDD Strategy and Implementation Plan and outlined by **Requirements 1.4a and 1.4b** of the Policy, agencies are to use the IDD Maturity Assessment Tool (and IDD MAT Companion Guide) to assess the current level of infrastructure digitalisation and data management maturity levels across the organisation. Subsequently, the agency must then define a target maturity level in the Agency-level IDD Strategy, and develop their Implementation Plans accordingly to address the gap between the current and target maturity levels over the 5-year IDD strategy time horizon.

These maturity assessments seek to provide the agency with a systematic approach to demonstrate a level of infrastructure data and digitalisation maturity and performance that is appropriate to the size and complexity of an agency's organisational structure and infrastructure portfolio.

The IDD Maturity Assessment Tool may also be used to assess the maturity levels of current service providers and potential future delivery partners for different phases of infrastructure asset lifecycle. Ensuring the capabilities of a delivery partner match or are better than the respective agency's level of maturity will help the agency achieve an overall improvement in the implementation of the IDD Policy.

The following outlines the key categories that frame the IDD Maturity Assessment, against which Agencies will be required to assess their organisation and provides the basis to identify any areas for uplift, which can be incorporated into the subsequently developed IDD Strategy and Implementation Plan.

Key categories of the Assessment:

- **Organisation and people:** This category evaluates how well an Agency's organisational structure and workforce are positioned to implement the **Actions** and **Requirements** outlined in the Policy, with consideration to the leadership and operational implementation, and assesses the organisations resourcing and capability.
- **Policy and process:** This category focuses on the alignment of internal policies, frameworks and guidelines to comply with the **Actions** and **Requirements** of the Policy, in conjunction with the wider policy (i.e. AM Policy) and compliance landscape (i.e. Gateway Assurance). It also looks to capture existing procurement and contract management processes, as they relate to supporting the outcomes of the Policy.
- **Information and data management:** This category evaluates Agencies maturity as it relates to infrastructure information and data management. This includes elements such as data governance, data standards and information requirements to align with the **Actions** and **Requirements** outlined in the Policy and support its outcomes.
- **Technology:** This category evaluates an Agency's readiness with regards to the technological elements needed to be considered to facilitate and support the outcomes of the Policy. Consideration is required as to any fit-for-purpose platforms, tools and systems to support the implementation of the CDE, as well as the extent to which any elements such as cyber-security and interoperability are considered.
- **Performance and continuous improvement:** This category evaluates an Agency's approach to continuous improvement and the monitoring/measuring of IDD initiatives and activities are implemented. These initiative and activities are required to comply with the **Actions** and **Requirements** outlined in the Policy and support the intended IDD outcomes.

By leveraging this comprehensive approach, the assessment process not only identifies current capabilities but also highlights any gaps and opportunities for growth.

Box 1: Managing change effectively

Incorporating effective change management practices further supports agencies in navigating organisational shifts, addressing any potential resistance, and engaging with stakeholders throughout the transformation. This ensures that the outcomes of the maturity assessment are embraced and acted upon at all levels within the agency.

In turn, change management becomes an integral part of the roadmap for digital transformation, enabling agencies to implement targeted improvements and achieve sustainable progress that aligns with the broader strategic goals of the Agency IDD Strategy and Implementation Plan.

A key aspect of the assessment is its emphasis on continuous improvement. By regularly evaluating and updating the agency's digital and data strategies, agencies can ensure they remain adaptable to technological advancements and any evolving industry standards.

Ultimately, the maturity assessment serves as the foundation for informed decision-making and strategic planning within the IDD Strategy and Implementation Plan. It empowers agencies to make evidence-based choices that enhance their digital capabilities, optimise resource allocation, and deliver improvements in infrastructure outcomes.

See **Section 6** for more information.

Section 4

4 | Implementation Guidance: Actions under Principle 2

4.1 Overview

Principle 2

Prioritise the adoption, application, and enablement of digital practices, processes, and technologies.

This **Principle** is aimed at advancing the adoption of digital practices by embedding strong infrastructure data management practices across all stages of the infrastructure asset lifecycle. Reliable interoperable data that can be shared and used by relevant parties, thereby establishing a 'digital thread', is fundamental to achieving infrastructure digitalisation.

Mandatory Actions under Principle 2 include:

- **Action 2.1** Agencies shall develop, document, and maintain data and information requirements to enable infrastructure digitalisation outcomes.

  This action is crucial for ensuring that digital transformation efforts are consistent, well-structured, and aligned with the agency's overall strategic goals. By clearly defining these requirements, agencies can streamline digital practices and enhance the management, security, and utilisation of data and information across their operations.

- **Action 2.2** Agencies shall establish an Infrastructure CDM to inform the development and operation of an Agency CDE.

  The common data model is critical as it ensures that all relevant data is consistently organised and easily accessible across the agency (See **Section 4.4.1**). By implementing a standardised data model, agencies can facilitate better data sharing, interoperability, accuracy and quality, ultimately enhancing the overall efficiency and effectiveness of infrastructure asset data management.

- **Action 2.3** Agencies shall establish data standards to ensure a unified approach to information and data management across the portfolio and the infrastructure asset lifecycle and for all relevant disciplines.

  By implementing standards, agencies can achieve consistent data management practices that enhance the interoperability, accuracy, fidelity, and utilisation of infrastructure data. This unified approach not only improves the efficiency and effectiveness of infrastructure management but also supports seamless integration and collaboration across different stages and disciplines within the agency.

4.2 Information and data management using ISO 19650

4.2.1 ISO 19650 and Building Information Modelling (BIM)

As specified by **Action 2.1** and **Requirement 2.1**, Agency's must develop sufficiently detailed data and information requirements and data management processes in accordance with ISO 19650 international best practices and embed them into its infrastructure delivery and asset management processes.

ISO 19650: Organisation and digitisation of information about buildings and civil engineering works, including building information modelling (BIM) is the international best practice standard for information and data management over the entire lifecycle of a built asset. ISO 19650 is used extensively both nationally and internationally throughout public and private infrastructure agencies and organisations.

ISO 19650 comprises a suite of documents outlining the concepts and principles of information management and the digitalisation of data in the building and civil infrastructure engineering sectors.

This international standard is a comprehensive guide to help organisations understand and implement digital practices, processes, systems, and technologies to improve their information and data management systems.

Box 2: ISO 19650 Document Suite

The documents within the ISO 19650 suite, primarily relate to data and information management throughout the different stages of the infrastructure asset lifecycle utilising 3D Information Models.

The standard consists of several parts, including:

- ISO 19650-1: Concepts and Principles
- ISO 19650-2: Delivery Phase of Assets
- ISO 19650-3: Operational Phase of Assets
- ISO 19650-4: Information Exchange
- ISO 19650-5: Security-Minded Approach to Information Management
- ISO 19650-6: Health and Safety.

Aligning internal practices and processes with this international standard, and in turn, designing internal data management systems enables organisations to work towards a 'digital thread' of infrastructure data. These documents can be applied to all types of infrastructure assets and to different types, sizes, and complexity of organisations.

Building Information Modelling

BIM is defined in ISO 19650 as the use of a shared digital representation of a built asset to facilitate planning, design, construction, and operation processes, forming a reliable basis for decision-making. It is a foundational enabler of infrastructure digitalisation and a key mechanism for achieving the objectives of the IDD Policy.

BIM is not just a 3D modelling tool — it is a structured, data-rich environment that supports the creation, management, and exchange of information across all stages of the infrastructure asset lifecycle. BIM enables the development of spatially accurate and semantically rich 3D Information Models that integrate both geometrical (graphical) and non-geometrical (non-graphical) data, including planning, design, construction, commissioning, operations, and maintenance information.

Box 3: BIM in Practice

For example, in a typical road infrastructure upgrade, BIM can be used to model existing site conditions using reality capture technologies, develop detailed design discipline models, simulate and evaluate construction sequencing to minimise traffic disruptions, and embed asset metadata such as pavement thickness, drainage specifications, asset equipment and maintenance schedules.

These models are then handed over to operations teams as part of the Asset Information Model (AIM), enabling predictive maintenance and long-term asset performance tracking. This integrated approach ensures that all stakeholders to work from a single source of truth, improving collaboration, reducing rework, and enhancing decision-making throughout the asset lifecycle.

4.2.2 Digital Engineering

What is it?

Digital engineering (DE) refers to a collaborative way of working that leverages digital processes, tools, and data to improve the planning, design, construction, operation, and maintenance of infrastructure assets. It enables organisations to shift from traditional, siloed workflows to integrated, data-driven approaches that enhance productivity, transparency, and decision-making across the asset lifecycle.

DE is not limited to the use of digital tools, it encompasses the strategic application of structured data, modelling environments, and interoperable systems to create a seamless digital thread. This thread connects information from concept development through to decommissioning, ensuring that data is consistently captured, shared, and reused to optimise asset performance and lifecycle outcomes.

Box 4: Digital Engineering in Practice

For example, in a large-scale infrastructure project, DE might involve:

- capturing existing site conditions using LiDAR and drone-based scanning and photogrammetry
- developing federated BIM models that integrate architectural, civil, structural, and mechanical and electrical systems designs
- using rule-based design automation to ensure compliance with engineering standards
- simulating construction sequences to optimise staging and reduce disruption
- linking asset metadata (e.g. component IDs, maintenance schedules etc.) to 3D models
- transitioning models into an Asset Information Model (AIM) for long-term operations.

Relationship with ISO 19650 and BIM

Digital engineering is closely aligned with the principles and practices outlined in ISO 19650, which provides the international framework for managing information throughout the lifecycle of built assets using BIM. While ISO 19650 focuses on the governance and management of information, DE provides the operational and technical means to implement those principles through digital workflows, modelling environments, and collaborative platforms. Together, DE and ISO 19650 support:

- creation of structured information models (e.g. PIM and AIM)
- definition and delivery of information requirements (e.g. OIR, AIR, PIR, EIR)
- use of CDEs to manage and exchange data
- integration of asset data into broader asset management systems (e.g. ISO 55001).

For more details on information requirements and information models refer to **Section 4.3**.

Box 5: Digital Engineering and how it relates to other ISO Standards

- Digital engineering activities, practices and systems can be integrated with existing asset and project management processes, procedures and systems. The level of maturity of the existing data environments must be taken into consideration when developing a 'fit-for-purpose' enterprise-wide system.
- Data is at the core of the asset lifecycle, as infrastructure data is created, processed and developed from one phase to the next. Digital engineering is the process used throughout the infrastructure asset lifecycle where data flows from phase to phase using digital practices, systems and technologies.
- Digital engineering practices should be included within project management procedures and can be aligned with ISO 21500, the international standard for project management. Information management with improved project management enhances asset management outcomes when aligned with ISO 55001 the Asset Management Standard.
- ISO 21500 specifies the organisational context and underlying concepts for undertaking project, program and portfolio management. It provides guidance for organisations to adopt and to improve project management practices, methodologies and processes. This standard was modelled on the Project Management Institute's Body of Knowledge (PMBoK) and is aligned with Asset Management Standard ISO 55001.

4.2.3 ISO 19650 and Asset Management

ISO 19650 plays a critical complementary role supporting both ISO 55001 Asset Management System Requirements[6], and ISO 55013 which provides guidance on the management of data assets in meeting its asset management objectives.

As asset management systems develop and become increasingly more reliant on asset data, ISO 19650 with ISO 55001 provides the guidance for managing asset data more efficiently. Asset data should be considered as a critical asset as much as the physical infrastructure asset and should be leveraged to optimise asset management outcomes.

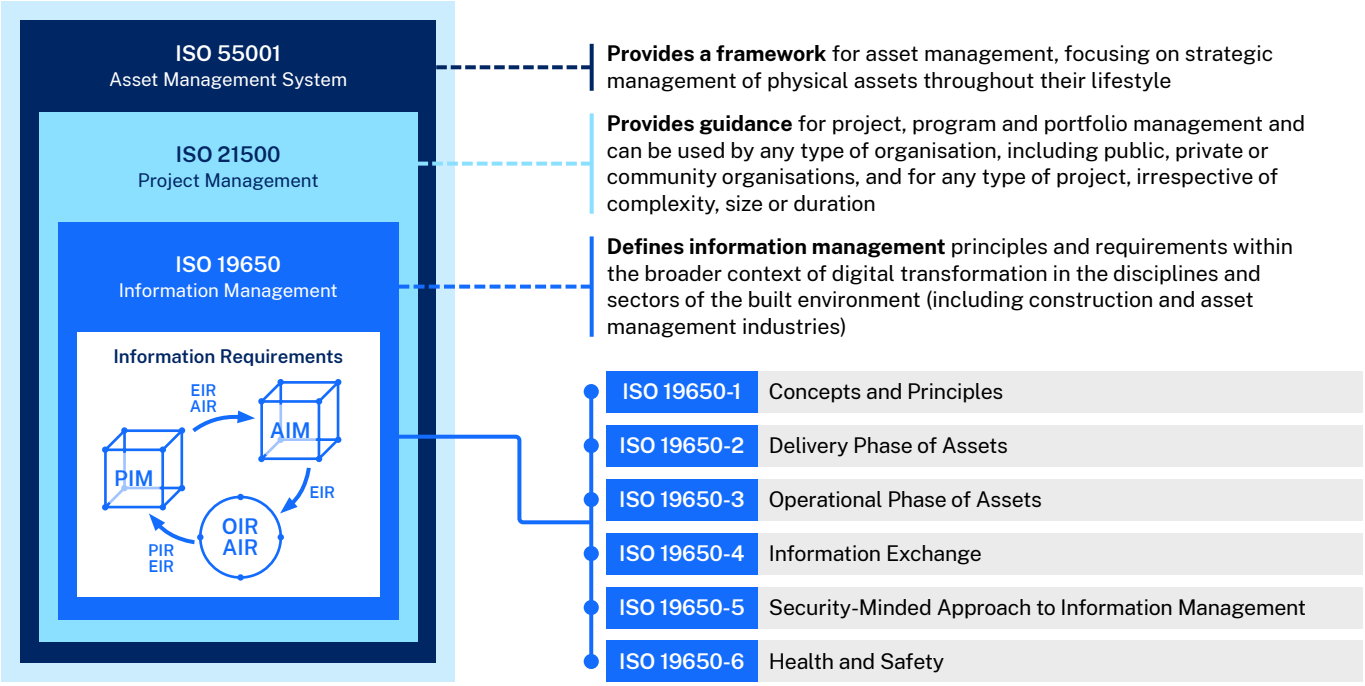
Some of the key points about the interrelationship between asset management and information management, as shown in Figure 4 and defined as follows:

- **Supporting data-driven asset management:** ISO 19650 ensures that the right information is available at the right time to optimise decision-making as prescribed by ISO 55001.
- **Enhancing operational efficiency:** By standardising infrastructure data and information management, ISO 19650 reduces errors, inefficiencies, and information loss, directly contributing to achieving the strategic asset management objectives required by ISO 55001.
- **Complementary, not subordinate:** While ISO 55001 outlines the requirements for managing assets, ISO 19650 focuses on the tactical management of data and information. Together, they form a comprehensive approach, particularly in industries where assets are highly information-dependent, like built infrastructure.
- **Asset lifecycle:** Both standards emphasise managing assets over their entire lifecycle, from creation to disposal. ISO 55001 focuses on managing assets based on the appropriate balance of cost, risk and performance, while ISO 19650 ensures that reliable and consistent data and information is available to support asset management across the lifecycle.
- **Data and information as an asset:** In ISO 55001, data is seen as a key asset, vital for decision-making and ISO 55013 provides guidance on the management of data assets. ISO 19650 contributes by providing a structured approach to managing information and data, ensuring that accurate and accessible data is available to support effective asset management decisions.
- **Digital transformation:** ISO 19650 facilitates infrastructure data and information management, which supports the optimisation of asset performance through data-driven strategies.

ISO 19650 enhances the implementation of ISO 55001 by ensuring efficient, structured, coordinated and collaborative infrastructure data and information management, which is critical for optimising asset management outcomes throughout its lifecycle.

6 Note that the ISO 55000 asset management standards apply to both tangible (equipment, property, infrastructure, etc) and intangible assets (intellectual property, digital assets, leases, etc) of an organisation. ISO 19650 on the other hand outlines best practice information (i.e. data) management as it applies to built assets (i.e. buildings and built environment infrastructure).

Figure 4 — Relationship between asset management and information management



4.3 Establishing agency information requirements

In further accordance with **Action 2.1**, agencies will need to determine their information requirements for each stage of the asset lifecycle. Information and data are typically required to support governance, operational and asset-related decision-making, including performance assessment against the organisation's requirements and objectives.

Agencies must be able to clearly define what information is required as 'information/data deliverables', so these requirements can be communicated to other stakeholders and delivery partners and for them to understand what to deliver.

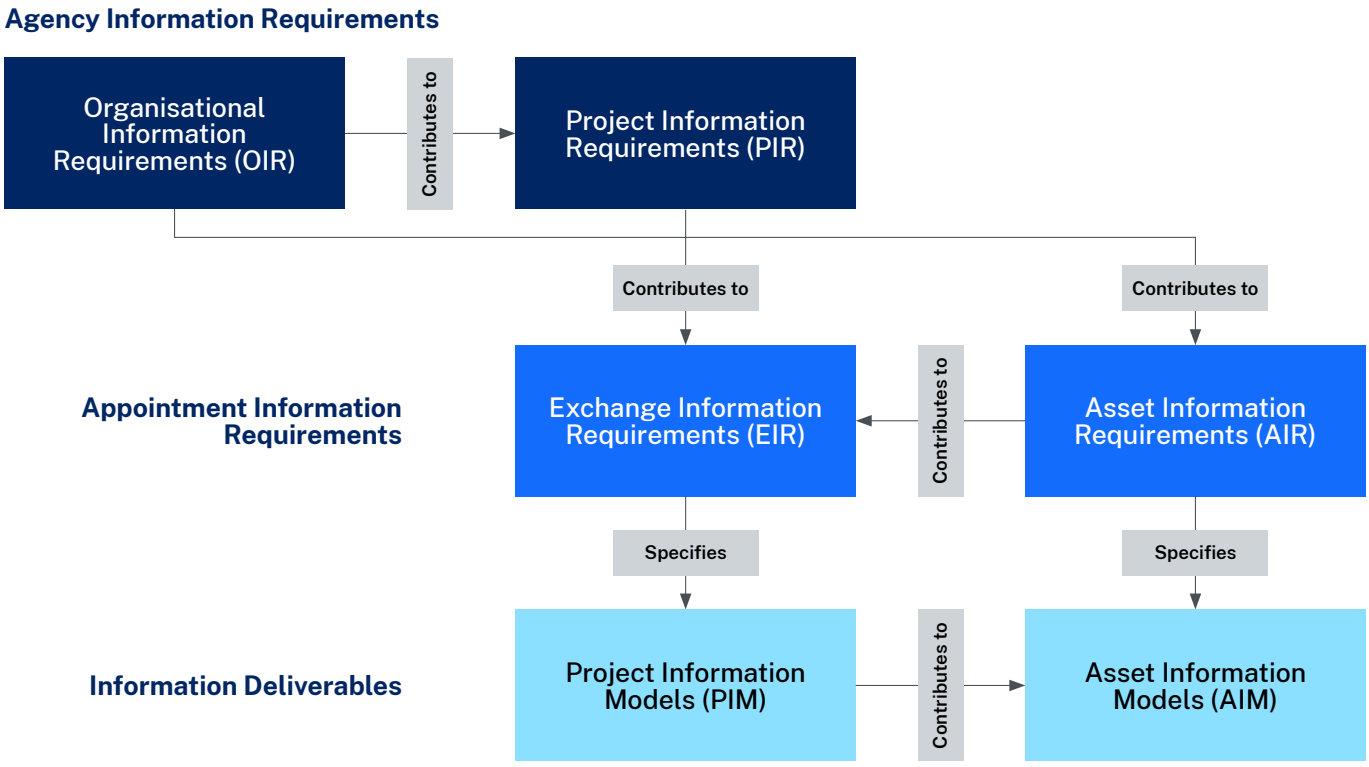
ISO 19650 defines 4 types of information requirements as outlined below:

1. Organisational Information Requirements (OIR)
2. Asset Information Requirements (AIR)
3. Project Information Requirements (PIR)
4. Exchange Information Requirements (EIR).

Based on these four information requirements, agencies should be developing the relevant **information models** to support efficient planning, delivery and management of infrastructure projects and assets.

ISO 19650 Part 1 defines the relationship between information requirements and information models, as outlined in Figure 5.

Figure 5 — Relationship between Information Requirements and Information Models



Organisational Information Requirements (OIR) focus on what data is necessary to operate and maintain the organisation's assets throughout their lifecycle, ensuring alignment with organisational goals, compliance, and operational efficiency. Each agency must define their respective organisational requirements for information and data.

The OIR must be aligned with the organisation's overall business strategy. This means understanding the role that assets play in delivering business outcomes and ensuring that the information gathered during the asset's lifecycle helps optimise asset performance and supports long-term goals.

Asset Information Requirements (AIR) refers to the data necessary to support the operation and maintenance of the asset once it is completed, handed over and the asset management system is being used for managing the asset through operations and maintenance. AIRs are based on the OIR and inform the Project Information Requirements (PIR) and are closely tied to the Exchange Information Requirements (EIR) focusing on the operational phase of the asset lifecycle.

This information typically includes:

- asset registers
- maintenance records
- performance and condition data
- health and safety information.

It ensures operational teams have the information and asset data needed for asset management, operations and maintenance.

Project Information Requirements (PIR) defines the information needed to manage and deliver the project effectively. PIRs set out and explain the information needed to answer or inform the strategic objectives of infrastructure projects. They convey the OIR with the AIR, and agency project requirements to internal project teams and project-specific external suppliers and delivery partners. PIRs set out the data and information to be delivered for planning, design and construction phases of infrastructure projects.

This project information might include:

- project data and information standards
- spatial data requirements
- cost, schedule, and sustainability requirements
- risk assessments and mitigation.

The Project Information Requirements may define different levels of information requirement need and detail based on the type of infrastructure project and the risk allocation of the project.

Exchange Information Requirements (EIR) define the data and information requirements when procuring services for the planning, design, construction, delivery or operations and maintenance of infrastructure assets. This document specifies the data and information requirements and deliverables that the appointing party (client/asset owner) expects at various project stages. The EIR includes:

- Technical Information Requirements: relates to what information is needed for design, construction, and operation.
- Commercial Information Requirements: relates to the contractual aspects, such as data formats, delivery milestones, responsibilities and accountabilities.
- Managerial Information Requirements: outlines the processes and protocols for managing the exchange of data.

The EIR acts as the foundation for information management, guiding the development of detailed information management plans and ensuring that project teams know what data they are required to collate, produce, manage, share and deliver. It should also become a subset of project requirements or equivalent contract documentation during procurement, with these requirements included in the project contract, and implemented through a BIM or (DE) execution plan (see **Section 5.4** for more on procurement and contracts).

4.4 Working towards a common data model (CDM)

4.4.1 Information models

The term 'Information Model' refers to the collation of asset data and information, that represent the infrastructure asset across the asset lifecycle. Information models provide both spatially accurate geometrical and non-geometrical data, including 3D models, drawings, documentation and datasets such as asset registers. Information models should be consistent across an agency and must enable the application to a single infrastructure asset or a portfolio of infrastructure assets.

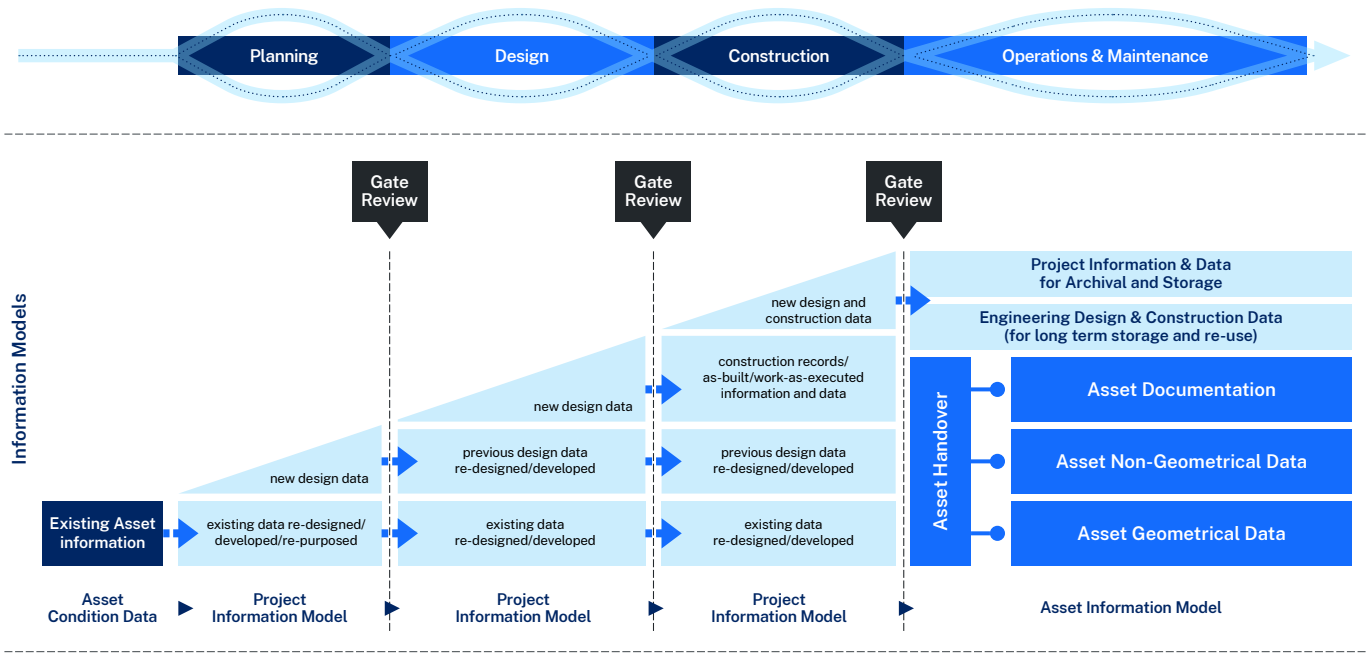
A project may be a greenfield or brownfield development but there is always a starting point for the Project Information Model (PIM). As the project progresses, more data and information are created and added to the PIM. This growth in infrastructure data and information is based on an increase in the level of detail (or level of information need), leading to the creation of the Asset Information Model (AIM) at asset handover.

Refer to Figure 6 showing the progressive development of project and asset data through the infrastructure asset lifecycle.

The Asset Maintainer (asset custodian or steward) will need to collate, record and store all infrastructure asset data from the PIM, and continue to manage and store the data over the operations and maintenance phase of the asset.

At each stage of the asset lifecycle, information and data is modelled spatially in 3D within various types of design software. Infrastructure elements and objects are embedded with asset information and data attributes relevant to the phase of the project. The asset data attributes within the 3D models are defined as 'metadata', or information about the data. To understand this data as well as the metadata within models, agencies must define the information requirements, data governance requirements and data standards for the management of infrastructure asset data and metadata.

Figure 6 — Progressive development of infrastructure data and information across the asset lifecycle



Project Information Model (PIM)

The PIM supports both the delivery of the project and is a major contributor to the Asset Information Model (AIM). The PIM is a collection of structured data produced during the planning, design and construction stages of the project. It is the overarching term given to all project and asset data generated during project planning and delivery, and includes all CAD, 3D/BIM Models, GIS, time, cost, quality, risk, information, data and other relevant items. Where project planning and development is outsourced, this asset data is produced, managed, and validated by an external supplier or service delivery partner prior to submission to the agency.

The service delivery partner must transition the PIM to the agency at the completion of the relevant contract as a consolidated deliverable for uploading into the relevant asset owner database or asset management system. This should include all environmental and contextual data that has informed the development of the design. In addition, it is critical that the PIM also includes the information required for operations and maintenance, information such as infrastructure and asset component warranties, guarantees, testing and commissioning data and other relevant data.

All the design details required for construction are typically not required for asset operations and maintenance but do need to be archived as an As-Built Model for future reference. This information and data, and all the associated as-built documentation is useful when an asset is renewed or repurposed. As-Built asset information can be shared across an agency for future planning projects within an asset portfolio or similar projects.

Asset Information Model (AIM)

The AIM supports the strategic and day-to-day asset and operations management activities for both the agency (as asset owner) and operator. The AIM typically contains asset registers, asset spatial and system hierarchy data, maintenance planning information, asset condition data, cumulative maintenance costs, records of installation and maintenance dates and other relevant asset information.

At the completion of the build phase, but before asset handover, the PIM is validated before forming the basis of the AIM. Upon completion, the AIM must represent a digital version of the physical infrastructure asset as constructed, supplemented with the data as defined in the PIR that records the details of installation, testing and commissioning data, and the assets' operational functional compliance.

The design and/or construction delivery partner is typically required to transition all the operations and maintenance data and information, models and associated datasets from the PIM into the AIM.

The AIM is the model that provides the infrastructure data and information required to support asset management, operations and maintenance. It is the single source of information related to an infrastructure asset or assets, at a level required to support an agency's asset management system.

When an agency implements the Policy, it is important to establish both data standards and robust data governance practices for the management of asset data and information and all its associated documentation.

Note that the AIM will continue to grow, based on changes to the asset over time, including the growth in data based on usage, condition and maintenance records and other relevant asset information.

Asset handover and as-built/work-as-executed information documents

Agencies will need to consider the storage and archival requirements of all data and associated documentation, not just the requirements for as-built/work-as-executed and asset handover documentation requirements. The collection, storage and archival of all documentation and data from all stages of the infrastructure project lifecycle is paramount.

The reuse of existing infrastructure data assets for additional purposes will be one of the greatest sources of value for NSW Government agencies, industry and the people of NSW. Reuse of information for whole-of-government data assets such as those presented in the NSW Spatial Digital Twin[7] (SDT). The NSW SDT will break down existing silos and artificial barriers to the use of data and information across agencies, administrative and jurisdictional boundaries. Reuse of data is facilitated by data standards, interoperable data systems, common data formats and proactive sharing and release of data.

Ongoing maintenance of asset data is a core process in infrastructure asset management. With the collection of large amounts of infrastructure data, it is essential to have the right practices and processes in place to monitor, maintain and update the asset data to ensure the ongoing efficiency and improvement of the infrastructure asset. Specification of the frequency of updates of data to align to organisational reporting requirements will reduce the friction associated with the generation of ad-hoc reports and data updates.

It is critical to the overall success of infrastructure data use, and re-use, that the specific information and data requirements are coordinated across the asset lifecycle and are clearly specified in contracts with delivery partners. The specification of data requirements should be completed as a collaboration between functional units responsible for infrastructure, data and assurance practices.

Agencies must consider the exchange information requirements including storage and archival for all data types and for their subsequent reuse and continued updating for maintenance purposes. Asset data may also be used to inform other NSW agencies on the existing site conditions, geotechnical data, as-built drawings, 3D models and asset information models that may be impacted by prospective new, or adjacent, or connected infrastructure. This data is known as 'shared data' and may be used within the NSW Spatial Digital Twin to represent the spatial geometric asset data for each agency.

7 NSW Government, Spatial Services, NSW Spatial Digital Twin

Box 6: Types of Data/Documentation collected throughout the Infrastructure Lifecycle

Examples of the types of data and documentation collected throughout the infrastructure lifecycle relating to any phase of the works may be, but are not limited to:

- survey and utility data
- geotechnical data
- design and construction models
- drawings, sketches and specifications
- digital records, computer software, engineering, construction and asset data
- information that was developed, collected, reviewed and shared during the various contracts and project stages.

4.4.2 Common data models (CDM)

In accordance with **Action 2.2** and **Requirements 2.2**, and to support the establishment of a CDE as specified in **Action 3.1**, Agencies are required to establish a CDM.

A CDM for infrastructure is a structured approach on how an agency views their infrastructure data and information. It ensures consistent and efficient management, sharing, and use of information across the infrastructure asset lifecycle. The CDM for an agency provides a unified approach to organising and exchanging infrastructure data and information. It ensures all stakeholders, from planning and design through to construction and operation, can collaborate using consistent, standardised and accessible data and information.

A CDM for infrastructure ensures that the data collected from different sources, such as architects, engineers, contractors, and operators, adheres to a standard hierarchy and format. This allows infrastructure data and information to be easily structured, shared and understood by all stakeholders, regardless of their specific systems or software.

Having established clear data and information requirements to support CDMs, each agency can define the subsequent Information Model requirements for each phase of the asset lifecycle to specify the appropriate agency asset operating model requirements.

4.5 Data standards, classifications and formats

Action 2.3 and **Requirements 2.3a, 2.3b** and **2.3c** of the Policy stipulates that agencies are required to establish and adopt appropriate data standards and classifications to ensure a unified approach to information and data management across the asset lifecycle, with a preference for open data formats where possible.

A **data standard** is a document that outlines the scope, specifications, characteristics, and requirements for a given type/set of data. It typically includes semantics, naming conventions, formats and classifications to help ensure there is a common understanding of the meaning of the data among stakeholders, and in turn, ensures data can be exchanged, leveraged and reliably re-used by different parties.

Open data standards and **formats** refer to non-proprietary, publicly accessible specifications that define the format, structure, and management of data. In principle, agencies should adopt open data formats throughout the asset lifecycle. These open standards are vendor neutral, meaning they are not tied to specific software or platforms, enabling data exchange between different systems, tools, and stakeholders.[8] Open data standards and formats ensure that data can be used, accessed, and shared by all relevant stakeholders throughout the asset lifecycle without proprietary restrictions, thereby fostering a transparent and collaborative environment. This is particularly important for the establishment of a CDE to help unlock the benefits of infrastructure digitalisation (see **Section 5.2** for guidance on establishing a CDE).

In establishing data standards, agencies should also develop a **data dictionary** that clearly defines the data elements, with consistent naming conventions for all data types and formats. A data dictionary is a tool/method for providing information about data assets (i.e. metadata) within an organisation or across organisations. A data dictionary is usually a collection of metadata within a specific database or system that describes the structure and properties of data elements such as object name, data type, classification and shows its relationships to other data types. ISO 27001 is the international standard for information security management systems (ISMS) and includes an annex on data classification.

It is also important that agencies adopt appropriate industry-recognised **classification systems** for infrastructure and asset data when establishing their data standards. There are several data classifications systems specific to physical assets that help standardise and categorise asset information including the hierarchical asset systems (see Box 7 for examples of asset classification systems). The adoption of an appropriate classification system ensures consistency and interoperability of asset data across the agency.

A data standard that includes a consistent structured data dictionary and application of appropriate asset classification systems, ensures all contracts and all phases of an infrastructure project have quality data that can be integrated into existing asset/data management systems (see Box 8 for a case study for how data standards are stipulated in the NSW Spatial Digital Twin (SDT) Policy Framework).

8 It is important that agencies do not confuse the concepts of open data standards and formats in this document with the concepts and requirements outlined in NSW Government's Open Data Policy. The NSW Open Data Policy supports the NSW Government's vision for better, faster and more open data, by making data available to the community, for research purposes, and for use by industry and NSW businesses. It is about government being open and transparent with its data to the public. While the NSW Open Data Policy remain applicable to agencies, the concepts of open data standards and formats referred to in the NSW Infrastructure Digitalisation and Data Policy and this Guide are distinct and should be considered separately.

Box 7: Examples of commonly used data standards, classifications and formats

Industry Foundation Classes (IFC)	Developed by buildingSMART International, IFC is an **open, non-proprietary data format** fused to describe building and infrastructure assets digitally. It supports **interoperability** across software platforms and disciplines, enabling consistent data exchange throughout the asset lifecycle. IFC is formally recognised under **ISO 16739** - Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries.
Construction Operations Building information exchange (COBie)	A **US-based data format** developed in 2007 to support the capture and delivery of asset data during design, construction, and handover phases. COBie links **building systems and assets to their physical environments**, facilitating operations and maintenance. It is often used in conjunction with IFC and other BIM standards.
Uniclass	A **UK-based classification system** designed to organise information across all sectors of the built environment, including buildings, infrastructure, and landscape. It is structured into multiple tables (e.g. activities, systems, products) and is aligned with **ISO 12006-2**.
OmniClass	A **North American classification system** developed by the Construction Specifications Institute (CSI) and Construction Specifications Canada (CSC). Like Uniclass, it is aligned with **ISO 12006-2**, but it provides more detailed classification for specific elements such as products, spaces, and disciplines. OmniClass is widely used in project planning and specification.

Box 8: NSW Spatial Digital Twin (SDT) Policy Framework

The NSW Spatial Digital Twin (SDT) Policy Framework stipulates mandatory spatial information requirements for NSW Government agencies and public service agencies when contributing to and using spatial information in the NSW Spatial Digital Twin. The Policy and Framework has been established to assist agencies in the federated ecosystem of the NSW SDT, facilitating the interoperability between all technology elements with the SDT to ensure that the collection of data and tools works as one ecosystem.

The SDT Policy provides Technical Requirements which are underpinned by a nationally endorsed set of best practice principles. This is accompanied by the NSW SDT Open Data Guidelines, which aims to provide a structure decision framework for data classification for agencies looking to integrate their datasets with the SDT. The SDT Policy Framework comprises of the following documents:

- **NSW Spatial Digital Twin Policy** contains a series of best practice requirements which provide guidance on obligations regarding the use of the NSW SDT.
- **NSW SDT Integration Guideline for 3D Infrastructure Models** outlines the level of detail and minimum requirements of building information models (BIMs) and other 3D infrastructure models that are ingested into the NSW SDT.
- **NSW SDT Contributor Guideline** provides advice to data custodians who are contributing information to the NSW SDT.
- **NSW SDT Open Data Guideline** provides a decision tree to evaluate any data made available in the NSW SDT as 'open' or 'shared'.
- **NSW SDT Guideline for Spatially Enabling Information** outlines current approaches across NSW Government to ensure the quality and consistency of spatially enabled data and information.

Compliance is mandatory for all agencies who share their data in the NSW SDT to ensure consistency and data quality.

4.6 The importance of data governance

Effective data governance is essential to ensure that the foundational elements of infrastructure digitalisation and the Policy are implemented. Information Requirements (IRs), Information Models (IMs), and data standards should not be treated as one-off deliverables, but actively managed, monitored, and continuously improved throughout the asset lifecycle.

As outlined in earlier sections of this Guide, agencies are required to define Information Requirements (see **Section 4.3**), establish structured Information Models (see **Section 4.4**), and adopt consistent data standards (see **Section 4.5**) in alignment with ISO 19650.

These elements form the backbone of a digital thread that supports reliable decision-making, asset performance optimisation, and whole-of-life value. However, without robust data governance, these practices risk becoming static, fragmented, or misaligned with evolving agency organisational needs.

Data governance ensures that:

- IRs and IMs are regularly reviewed and updated to reflect changes in asset condition, operational context, or strategic priorities
- data standards are enforced across disciplines and delivery partners, promoting consistency and interoperability
- roles and responsibilities for data ownership/stewardship are clearly defined and embedded within governance structures.

This is particularly critical during the 18-month transition period, where agencies are establishing core governance structures to support the initial implementation of the IDD Policy.

As agencies mature, governance structures should evolve to support broader digital transformation objectives. Data governance provides the mechanism to bridge this transition thereby ensuring continuity, accountability, and adaptability across both short-term compliance and long-term strategic uplift.

4.6.1 Leveraging the NSW Data Governance Toolkit

NSW Government agencies have access to guidance documentation on data requirements through the NSW Data Governance Toolkit[9], which is a valuable resource designed to assist agencies to develop their own data governance capability.

The toolkit leverages the Data Management Association International (DAMA) Data Management Body of Knowledge (DMBOK) and can be applied to the development of data governance management systems as part of an agency's infrastructure data program (see Table 4).

The toolkit outlines a data governance model that specifies the data governance activities across 4 operational areas.

- **Strategy and planning:** Defines the value, vision, and mission of the data governance program.
- **Organisational structures / roles and responsibilities:** Formalises accountability and decision-making authority for data-related activities.
- **Organisational enablers:** Establishes leadership support and builds capability across people, processes, and technologies.
- **Data management:** Covers core functions such as data quality, metadata, data security, and lifecycle management, as outlined in the Data Management Body of Knowledge[10]

The toolkit provides agencies with a strategic and consistent approach to managing infrastructure data and information assets. It complements the IDD Policy by offering practical guidance on how to embed governance into day-to-day operations of an agency and align with broader government expectations.

9 Data.NSW, Data Governance Toolkit, 2025
10 Data Management Association, Data Management Body of Knowledge, 2018

Table 4 — Data Management Body of Knowledge (DAMA-DMBOK) - overview

Data Management	
Data governance sets the rules of engagement for how data-related decisions are made within an agency through the setting of data policies and practices. Data management refers to the planning, execution and operation of data related policies and practices. The DAMA-DMBOK provides a comprehensive framework for data management, structured around 11 knowledge areas, which are expanded on in the NSW Data Governance Toolkit.	
Data governance	Defines the framework and processes for ensuring data assets are managed effectively, including policies, roles, and responsibilities.
Data architecture	Focuses on designing the structure and flow of data within an organisation, including models, standards, and data integration strategies.
Data modelling and design	Covers techniques and methodologies for creating data models that represent the data requirements and business rules of an agency or organisation.
Data storage and operations	Deals with the physical storage, retrieval, and maintenance of data, including database management, performance optimisation, and backup and recovery.
Data security	Addresses safeguarding data against unauthorised access or corruption, ensuring confidentiality, integrity, and availability through policies, encryption, and access control.
Data integration and interoperability	Involves combining data from multiple sources, ensuring smooth data exchange between systems and maintaining data consistency.
Document and content management	Encompasses managing unstructured data, such as documents, emails, and multimedia, ensuring it is stored, retrieved, and archived efficiently
Data quality management	Focuses on ensuring data is accurate, consistent, complete, and usable, with processes for monitoring and improving data quality.
Master and reference data management	Involves managing key enterprise data entities (master data) and the standardised reference data used across the agency or organisation.
Data warehousing and business intelligence	Covers collecting and storing data for reporting, analysis, and decision-making, including data warehouses, data lakes, and analytical tools.
Metadata management	Deals with the management of data about data (metadata), ensuring data lineage, context, and meanings are clear for data users

Source: DAMA® Data Management Body of Knowledge (DAMA-DMBOK®)

4.6.2 Importance of cyber security and data security

As outlined above, fit-for-purpose data governance is essential to ensure information requirements, data management and data standards are aligned and consistently applied with an organisation.

As technology continues to permeate the built infrastructure asset environment, and data becomes a fundamental element of facilitating information exchange, the importance of cyber and data security should be a core element of any data governance framework. It is important the cyber and data security is not considered as being solely standalone elements but are to be embedded as part of foundational aspects of data governance.

Effective and fit-for-purpose data governance ensures that the exchange of information and data adhere to defined NSW government policies, standards and procedures, and international standards such as ISO 27001, to properly manage and mitigate risks around data privacy, ownership and exchange.

Box 9: Policy, frameworks and best practice when considering cyber and data security

NSW Cyber Security Policy	Released in 2019 aimed to reduce impacts to confidentiality, integrity and availability of services and information, by ensuring cyber security risks to the information and systems of departments and agencies are appropriately managed. Although not explicitly identifying built assets, the policy provides the frameworks on how they should consider cyber security.
ISO 27001:2022	ISO/IEC 27001 is an international best practice standard for **information security management systems (ISMS)**. It defines requirements an ISMS must meet. The standard provides guidance for establishing, implementing, maintaining and continually improving an information security management system.
ISO 19650: Part 5	Part of the broader ISO 19650 series, Part 5 focuses on a security-minded approach to information management within the context of BIM. It focuses on protecting sensitive project and asset information throughout the digital and physical asset lifecycle, providing guidance on implementing security measures like role-based access control and secure federation, ensuring information security for all project stakeholders.
Institution of Engineering and Technology (IET): Cyber Security in the Built Environment	First published in 2014, Cyber Security in the Built Environment by IET, was developed with the aim to provide guidance for those working across the infrastructure lifecycle phases, as to how to approach cyber security in built infrastructure assets from the start. It reinforced that cyber security should be considered as a core and integral part, from design, construction and operations.

Section 5

5 | Implementation Guidance: Actions under Principle 3

5.1 Overview

Principle 3

Manage technology and data as an asset throughout the infrastructure lifecycle

This **Principle** emphasises the importance of managing technology and data as assets throughout the infrastructure lifecycle with an appropriate level of rigour. This includes, getting the most out of infrastructure data by establishing a CDE, which serves as a centralised digital repository for collating, storing, managing, and accessing all relevant infrastructure data throughout the asset lifecycle. **Actions** under this **Principle** also focus on ensuring information and data requirements are appropriately reflected and managed through procurement and contracts.

Mandatory Actions under Principle 3 include:

- **Action 3.1** Agencies shall establish and maintain a CDE.

  This action mandates agencies to establish and maintain a CDE. (See **Section 5.2**). This centralised digital data environment is crucial for collating, managing, storing, and distributing all relevant infrastructure data, ensuring that all stakeholders have access to accurate, timely, and up to date information. By adopting open data formats within the CDE, agencies can achieve interoperability, transparency, and mitigate risks associated with incompatible software systems and file formats.

- **Action 3.2** Agencies shall develop and implement an IDD Technology Plan to support their IDD Strategy and Implementation Plan.

  This action mandates that agencies develop and implement an IDD Technology Plan to support the IDD Strategy and Implementation Plan. This ensures that the technology framework is aligned with the strategic objectives of the agency, facilitating effective data management and data integration across the infrastructure asset lifecycle. By establishing a robust IDD Technology Plan and framework, agencies can streamline operations, improve data accessibility, and foster a collaborative environment among all stakeholders involved in infrastructure asset projects.

- **Action 3.3** Agencies shall reflect their information requirements and data standards in procurement processes and contracts to enable data sharing and information reliance.

  This action mandates that agencies integrate their information requirements and data standards into procurement processes and contracts. This ensures that data sharing and information reliance are embedded within the fundamental stages of project execution. By doing so, agencies can guarantee that all stakeholders adhere to consistent data guidelines and protocols, fostering a cohesive environment for data and information exchange and collaboration.

- **Action 3.4** Agencies shall document and formally agree an IDD Operating Framework that outlines the organisation's approach to day-to-day activities, processes and decisions from an operational perspective.

  This action mandates agencies to document and formally agree upon an IDD Operating Framework. This framework outlines the organisation's approach to day-to-day activities, processes, and decisions from an operational perspective. By defining clear protocols and procedures, the IDD Operating Framework ensures a consistent and structured approach to managing infrastructure data and technology, thereby enhancing operational efficiency and fostering a transparent and collaborative environment.

5.2 Common data environment

As stipulated in **Action 3.1** and **Requirement 3.1** of the Policy, agencies are required to establish and maintain a CDE. A common data environment and workflow are critical to ensuring all infrastructure stakeholders access the right information about an agency's infrastructure asset portfolio at the right time. It refers to a group of integrated technology systems within an agency or organisation that enables users to collaboratively collect, store, use and exchange infrastructure data and information.

This environment serves as a shared digital data platform for managing, collecting, and distributing data and information pertinent to construction projects. The implementation of a CDE is vital for ensuring that all stakeholders involved in the asset lifecycle have access to accurate, timely, and up to date information, thereby fostering transparency, collaboration, and operational efficiency (see Box 10 for benefits of a CDE).

Having established the common data model for all data types throughout the asset lifecycle (as outlined in **Section 4.4.1**), the common data environment ensures the flow of data from phase to phase, or contract to contract, and from data owner to data owner is efficient and seamless. The CDE is a connected ecosystem of applications to manage information and data that represents the central repository for all infrastructure data for an agency.

Implementing a CDE is critical for agencies in managing technology and data as strategic assets throughout the infrastructure lifecycle. This centralised repository not only facilitates data governance but also enhances interoperability between systems. It ensures the security and accessibility of crucial infrastructure data, contributing to the overall effectiveness and efficiency in project execution.

Box 10: Benefits of a common data environment (CDE)

- **Improved collaboration:** The CDE promotes seamless communication and collaboration among various teams and stakeholders, therefore reducing duplication of efforts and inconsistencies through shared access to common data.
- **Enhanced data quality:** By maintaining high standards for data accuracy and reliability, the CDE ensures that all parties have access to the most current information, which is essential for informed decision-making and strategic planning.
- **Increased efficiency:** Streamlining processes by providing a single source of truth for all project-related data, reduces the time spent searching for information, thereby enhancing productivity and operational efficiency.
- **Better decision-making:** The CDE offers comprehensive and up-to-date data, enabling stakeholders to make informed decisions and strategic plans based on reliable data.
- **Data governance:** Embedding data governance within core agency functions ensures the quality, security (including cyber security), interoperability, and accessibility of infrastructure data. This robust infrastructure data strategy enhances data transparency, accountability, and collaboration both within and across agencies.

Implementing a CDE

For effective implementation of a CDE, agencies must establish protocols that include data entry standards, access permissions, and regular audits to ensure data integrity. The agency's ICT team's involvement is essential for successful implementation and ongoing management of the CDE.

Agencies should define the CDE within the IDD Technology Plan and align it with the IDD Strategy and Implementation Plan. This alignment ensures that agencies are equipped with the necessary tools and practices for managing infrastructure data as an invaluable asset, contributing to the overarching goals of the Policy. Training and professional development for agency personnel and stakeholders is crucial to promote effective adoption and use of the CDE, fostering a culture of collaboration and advancing data-driven decision-making.

In defining the CDE agencies must consider technologies that provide open data formats and avoid technologies that limit compatibility or interoperability with downstream data users or data owners. Using bespoke technologies or software solutions can create barriers for prospective delivery partners and their ability to work with agencies and potentially stifle the efficiency and productivity benefits associated with infrastructure digitalisation.

5.3 IDD Technology Plan

To support the Agency IDD Strategy and Implementation Plan, **Action 3.2** requires agencies to develop and maintain an IDD Technology Plan. This plan should identify and assess the technologies, tools, and platforms that will enable digital infrastructure delivery, support ongoing operations, and align with broader digital transformation strategies and goals. Evaluations must consider cost, benefits, risks, interoperability with the CDE, cyber security, and scalability.

The Policy provides a flexible framework that empowers agencies to tailor their digital transformation efforts to their specific asset base and operational context. Agencies are encouraged to explore technologies that best support their strategic objectives and data management needs. In exploring technologies, agencies should consider cost, benefits, risks, interoperability with the CDE, cyber security, and scalability of potential solutions.

Agencies should begin by assessing their current digital tools and systems. This includes identifying gaps, evaluating performance, determining which technologies are most suitable for treating data as a strategic asset across the infrastructure lifecycle to achieve the organisation's overarching objectives, whilst ensuring value for money is achieved. The IDD Technology Plan should incorporate the CDM and

CDE as foundational elements to ensure consistency and integration. Moreover, agencies may wish to establish a standalone IDD Technology Plan or integrate it into an existing plan where appropriate.

Key considerations for the technology plan include:

- the agency's strategic objectives including service delivery objectives
- a comprehensive review of existing digital capabilities, software and platforms
- strategic assessment of value for money
- identification of opportunities to enhance data management and digital delivery
- strategies to embed data governance and promote transparency and accountability
- provisions for regular updates to remain aligned with emerging technologies and evolving digital needs.

The plan should also foster collaboration, both within and across agencies, by promoting shared data standards and interoperable systems. This will enable more effective data sharing, reduce duplication of effort, and support coordinated infrastructure delivery and asset management outcomes.

By implementing a fit-for-purpose IDD Technology Plan, agencies can unlock a range of benefits such as improved project delivery, optimised asset management, enhanced safety, and better decision-making. These outcomes contribute to a more efficient and responsive public infrastructure network.

Agencies are encouraged to explore and adopt digital tools that support continuous improvement. Modern platforms offer capabilities such as real-time data integration, visualisation, automation, and predictive analytics. These tools enhance operational efficiency and stakeholder engagement across the infrastructure asset portfolio.

A forward-looking approach also requires consideration of emerging technologies such as artificial intelligence, machine learning, robotics, and extended reality. Agencies should consider piloting innovative solutions where appropriate, share lessons learned, and contribute to a culture of experimentation and knowledge sharing across the sector.

5.3.1 Artificial Intelligence – opportunities and ethical use

Artificial Intelligence (AI) is rapidly emerging as a transformative enabler of infrastructure digitalisation. From predictive maintenance and automated design validation to real-time asset monitoring and data-driven decision-making, AI offers significant opportunities to improve productivity, efficiency, and service delivery across the infrastructure lifecycle.

A 2025 report by the Australian Government's Productivity Commission suggests that AI could contribute up to $116 billion to Australia's economy over the next decade, with public sector applications playing a key role in unlocking these gains through smarter infrastructure planning, delivery, and asset management.[11]

In exploring AI through the development of the IDD Technology Plan, agencies should consider the following:

- AI opportunities that align with strategic infrastructure objectives (i.e. aligned with the IDD Strategy and Implementation Plans).
- Ensure AI systems are supported by robust data governance and cyber security practices.
- Consider whether AI is a strategic enabler that supports the broader digital transformation of infrastructure delivery and asset management.

Importantly, in exploring AI technologies within their IDD Technology Plans, it is essential for agencies to have regard to NSW Government policies, frameworks and other requirements that guide ethical, secure, and responsible use of AI (see Box 11).

When exploring AI technologies, agencies should explore the NSW Government AI Assessment Framework and AI Assurance Approach, as well as international best practice standards such as ISO 42001. ISO/IEC 42001 is an international standard that specifies requirements for establishing, implementing, maintaining, and continually improving an Artificial Intelligence Management System (AIMS) within organisations. It is designed for entities providing or utilising AI-based products or services, ensuring responsible development and use of AI systems.

11 Australian Government – Productivity Commission (2025), Harnessing data and digital technology (Interim report), https://www.pc.gov.au/inquiries/current/data-digital/interim

Box 11: Benefits of a common data environment (CDE)

The NSW Artificial Intelligence Ethics Policy sets out five mandatory principles to ensure the trustworthy, transparent, and accountable use of AI in public sector decision-making. These principles require that AI must be:

- the most appropriate solution for the service or policy problem
- used in ways that mitigate bias and uphold fairness
- safe, secure, and compliant with privacy and information access requirements
- transparent, with mechanisms for public review and oversight
- always subject to human review and intervention.

Agencies should also refer to the NSW AI Assurance Framework and the Ethical Use Policy Statement to guide responsible implementation and governance of AI systems.

5.4 Procurement and contracts

Procurement and contracting are critical levers for embedding infrastructure digitalisation and data management practices across the asset lifecycle. **Action 3.3** of the Policy stipulates that agencies should reflect their information requirements and data standards into their procurement processes and contracts to enable data sharing and information reliance. This is important to ensure the digital thread of data can be maintained throughout the asset lifecycle.

5.4.1 Information requirements specified during procurement

Agencies should ensure internal documentation for managing projects (e.g. agency project management plans) clearly set out the detailed data and information (management) requirements for project delivery. Project management plans should include details for all data types and information deliverables as well as detailing the OIR, PIR, AIR and EIR for delivering a project, program or portfolio of infrastructure assets.

When engaging external delivery partners, agencies must explicitly define the data and information requirements within tender documentation. These requirements should be tailored to the specific scope of works or services brief and aligned with the agency's broader digitalisation strategy. As mentioned in **Section 4.3**, the agency's EIR is particularly important in this regard, which should include enough detail to enable external providers to adequately assess the scope and commercial implications of the client's BIM / DE requirements. These requirements should in turn be embedded in the project contract and delivered through a BIM / DE execution plan.

By developing detailed information requirements for both internal teams and external delivery partners, agencies can enhance the quality and consistency of deliverables throughout the planning, design, construction, and operational phases of infrastructure assets. Recognising data and information as strategic assets is essential, and their procurement should be treated with the same importance as physical infrastructure to support optimal asset performance and lifecycle management.

Procurement practices must also align with the overarching goals of the Policy. Contracts should include provisions for regular review and updates to ensure data management practices remain current and effective. Key considerations such as data security, interoperability, and accessibility must be addressed to safeguard infrastructure data integrity.

Ultimately, effective procurement of digital services and technologies, clear contract management, and a skilled workforce are critical to achieving the Policy's objectives. By embedding these practices, agencies will be better positioned to harness the full potential of digitalisation thereby leading to improved project delivery and asset management outcomes.

5.4.2 Contractual and legal considerations

There are commercial and legal implications of embedding digitalisation / data requirements as part of broader project delivery requirements in procurement contracts. These considerations should be identified early in the procurement lifecycle – in consultation with the relevant commercial and legal teams – and reflected in tender documentation, scope of works, service briefs and contract clauses.

Key commercial and legal considerations may include matters related to:

- **Data ownership and sovereignty** - ownership of digital deliverables, including BIM models, asset information, metadata, and documentation.
- **Information reliance and liability** - the extent to which digital information can be relied upon for decision-making, and who bears responsibility for errors or omissions in digital deliverables.
- **Intellectual Property (IP) rights** - IP rights over digital models, software, and data generated during the project.
- **Confidentiality and privacy** - compliance with relevant privacy legislation and inclusion of relevant/appropriate confidentiality stipulations.
- **Dispute resolution and traceability** - mechanisms for resolving disputes related to digital deliverables (i.e. 3D Models etc) and fit-for-purpose digital records that ensure information can be traced throughout the project lifecycle.

While the approach to contracts may differ on a case-by-case basis, there are publicly available resources agencies may find useful, as outlined in Box 12.

Box 12: Contractual and legal considerations in infrastructure digitalisation

The Victorian Digital Asset Strategy (VDAS) outlines common legal and commercial considerations that may impact the implementation of digital and data practices across the infrastructure lifecycle. These include:

- data sovereignty and ownership, especially with regards to critical assets
- critical asset requirements
- data security and integrity
- liability and information reliance
- intellectual property, ownership and licensing
- confidentially and privacy.

The New Zealand BIM Handbook highlights contractual and legal implications of BIM adoption, including:

- definition of roles and responsibilities for model authorship and coordination
- intellectual property rights and licensing of digital models
- model reliance and liability, particularly in relation to design intent vs. construction deliverables
- data exchange protocols and interoperability standards
- the need for BIM Execution Plans (BEPs) to be contractually referenced and aligned with project delivery.

5.5 IDD Operating Framework

Action 3.4 mandates that agencies document and formally agree on an **IDD Operating Framework**. This framework should outline the organisation's approach to day-to-day activities, practices and processes related to infrastructure digitalisation and data management, from an operational perspective. It ensures that all actions taken at the operational level align with the overarching goals of the Policy, fostering consistency, efficiency, and accountability across all agency functions.

The framework should encompass all relevant documents that collectively represent the organisation's operational processes related to infrastructure digitalisation and data management. This includes data collection, storage, analysis, and dissemination protocols that align with IDD **Principles**. Clearly defined guidelines for decision-making at various operational levels should be established to ensure uniformity in decisions across the agency, minimising discrepancies and enhancing operational efficiency. The framework must outline the roles and responsibilities of all staff involved in infrastructure digitalisation activities. This clarity helps in managing expectations and facilitates better coordination and accountability.

Establishing key performance indicators (KPIs) and metrics is crucial to monitor and evaluate the effectiveness of the IDD Operating Framework. These metrics should be regularly reviewed and updated to reflect the evolving needs and goals of the agency. The framework should incorporate mechanisms for continuous improvement, enabling the agency to adapt to new technologies and methodologies. This ensures that the agency remains at the forefront of infrastructure digitalisation practices.

Ongoing training programs, professional development opportunities and support for all staff are essential to maintain a high level of competency in digital tools and processes. The framework should specify the frequency and scope of these training programs with suitable change management activities and experienced change management staff. Regular reviews and updates to the IDD Operating Framework are necessary to ensure its relevance and effectiveness. This includes periodic assessments and revisions based on feedback and technological advancements.

By documenting and formally agreeing on an IDD Operating Framework, agencies will ensure that their operational activities are aligned with the strategic objectives of the Policy. This will lead to more efficient and effective infrastructure digitalisation, ultimately enhancing service delivery and asset management.

Section 6

6 Implementation Guidance: Actions under Principle 4

6.1 Overview

Principle 4

Invest in capability to advance infrastructure digitalisation

This **Principle** emphasises the importance of investing in workforce capability to enhance infrastructure digitalisation. It requires agencies to identify and fill critical roles necessary for executing the IDD Strategy and Implementation Plan, and to develop a fit-for-purpose **IDD Capability Uplift Plan**. This plan should focus on acquiring, growing, and retaining the skills and resources needed to drive lasting change and fully harness digital opportunities across the infrastructure lifecycle.

Mandatory Actions under Principle 4 include:

- **Action 4.1** Agencies shall identify critical roles and responsibilities to execute the IDD Strategy and Implementation Plan, and ensure these roles are filled.

  This action requires agencies to identify and fill critical roles and responsibilities necessary for executing the IDD Strategy and Implementation Plan. By ensuring these roles are filled, agencies can effectively drive strategic objectives and enable cross-functional collaboration, aligning digital initiatives with the broader goals of the Policy.

- **Action 4.2** Agencies shall develop and execute an IDD Capability Uplift Plan to acquire, grow and retain the required skills and drive lasting change.

  This action mandates that agencies develop and execute an IDD Capability Uplift Plan aiming to acquire, grow, and retain essential skills and resources. This action is critical to driving lasting change and fully leveraging digital opportunities throughout the infrastructure lifecycle. By focusing on fit-for-purpose training programs, targeted recruitment strategies, and continuous professional development, agencies will ensure they have the necessary workforce capabilities to advance infrastructure digitalisation.

6.2 Investment in workforce and capability uplift

Action 4.1 and **4.2** of the Policy requires agencies to assess their existing workforce and invest in the capabilities and critical roles needed to advance infrastructure digitalisation.

To ensure the successful implementation of the IDD Strategy and Implementation Plan, agencies must clearly define the responsibilities for specific business functions and critical roles required for infrastructure digitalisation and data management (refer to **Section 3.4.2**). These roles may already exist within functional areas such as asset management, project delivery, operations, maintenance, design and engineering, project controls, strategy, procurement, commercial among others.

Agencies are required to develop an IDD Capability Uplift Plan that outlines the steps and initiatives required to achieve the capability uplift needed to deliver the requirements of the IDD Policy and embed digitalisation practices in the agency's infrastructure delivery and asset management operations. In doing so, agencies should consider working with their internal People & Culture Team.

In developing this Plan, agencies should consider:

- **Undertaking a capability assessment** (i.e. gap analysis) of the types of capabilities the organisation currently has, and the capabilities it needs to achieve its strategic objectives consistent with IDD Policy.
- **Different ways to uplift capability** for example, through:
  - Continuous development: fostering forums of knowledge sharing and innovation within and across agencies such as communities of practice. Participation in industry events, conferences, attending continuing professional development (CPD) seminars and other learning and development opportunities to enhances employee's skills and capabilities.
  - Training initiatives: investing in the implementation or facilitation of employee participation in structured/approved training programs to enhance current employee's skills and capabilities. This training may include workshops, online courses, certifications, qualifications and masterclasses tailored to infrastructure digitalisation and data management.
  - Recruitment and retention strategies: attracting appropriate talent by creating (or updating existing) role descriptions to be fit-for-purpose with digital and data management capability requirements.
- **Change management practices:** engaging in effective change management practices with executive leadership support to ensure smooth transitions and adoption of new technologies and processes.

In developing IDD Capability Uplift Plans, agencies are also encouraged to explore and leverage existing NSW Government resources.

6.3 Change-supported capability uplift

Successful implementation of the NSW Infrastructure Digitalisation and Data (IDD) Policy requires agencies to make sustained shifts in how infrastructure is planned, delivered and managed through changes to individual behaviour, agency systems and organisational culture. This shift or transition should be actively supported by structured change management processes.

Change management is a disciplined approach that helps individuals, teams and organisations transition from 'current' to 'future' ways of working. In the context of the Policy, change management should guide an agency's transformation activities to ensure that individuals and teams are adequately aware of the transition, and are equipped and motivated to integrate Policy **Principles** and **Actions** into infrastructure delivery and asset management practices. Effective change management will also support long-term capability uplift by guiding staff with the right actions to build readiness for change, and to manage any disruptions to processes and reinforce any new ways of working.

Agencies may wish to leverage recognised change management methodologies and frameworks for driving individual and organisational change (see Box 13 for an example). Structured change management methodologies can guide agencies in planning and sequencing of change activities across various 'transformation phases' such as justification of the need for change, through to implementation and scaling of any new practices and processes.

Structured change management frameworks help to guide the delivery of content material, timing of transitions, format of material, and target the right audience of any communications. Change management frameworks can provide a structure for prioritising training activities to better support staff through transitions and to help strengthen the adoption of the Policy.

Governance groups and change management frameworks should ensure that there is clear policy leadership within the agency and clear ownership and accountability for the Agency's IDD implementation program and IDD Capability Uplift Plan. In developing the IDD Implementation Plan and Capability Uplift Plan, governance groups should also ensure that change management considerations guide and coordinate actions across these plans, including planning for capability, communications, technology change, and any workforce requirements.

Box 13: Structured change management methodology - ADKAR® Model

The ADKAR® Model for change management is an internationally recognised methodology for driving individual and organisational change. It provides a simple and practical framework for successful understanding and sustained change from a need's perspective. It equips leaders with the strategies and tools to provide individuals and the agency with what they might need to apply the Policy confidently and consistently.

ADKAR breaks change down into 5 key building blocks:

Awareness – of the need for change

Desire – to participate in and support the change

Knowledge – on how to adopt the change

Ability – to implement the required skills and behaviours

Reinforcement – to sustain the change over time.

This structure can support agencies to proactively plan the content, format, target audience and timing of any communications and training activities, as well as identify support to where it is most needed. It also helps to identify the different change activities over time.

Source: Prosci ADKAR® Model

Effective change management typically involves:

- **Identifying key stakeholders** by assessing their influence, interest, policy impact, roles and responsibilities. Including those who benefit from, sponsor, champion, define, support, or adopt the transformation. Tools like a power–interest grid or RASCI matrix can assist with this analysis.
- **Assessing the current state** and change impacts at the process and role level to understand how implementation of the Policy's mandatory **Actions** will affect day-to-day work, systems, and staff expectations for an agency. This may involve structured change impact assessment workshops with key business functions to pinpoint who would be impacted by any process changes. These insights should inform targeted strategies for communication, training, and support, and should be documented in relevant planning documents.
- **Engaging key stakeholders** in both designing and implementing the change. Stakeholder insights are important for identifying obstacles to the Policy implementation. Their knowledge can help shape the IDD Capability Uplift Plan, and they may assist in communicating key messages and encouraging team participation.
- **Conducting readiness assessments** at key stages to gauge whether people, processes, and systems are prepared for any change or transition. These assessments help identify gaps in awareness, capability, and support, ensuring the right tools, guidance, and communication channels are in place to enable a smooth transition and foster long-term adoption.
- **Delivering engagement activities to sustain momentum** and embed change over time. This includes showcasing early wins, promoting best practices adopted across projects, and creating networks to enable knowledge sharing and ongoing peer learning and development.
- **Establishing mechanisms to monitor progress**, capture feedback, and identify improvement opportunities to ensure IDD Strategy and Implementation Plans evolve in response to stakeholder needs and provide further support as required.

As new behaviours and processes are reinforced over time, agencies can achieve long term value from their investment and realise the benefits of infrastructure digitalisation and data management.

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