GOVERNMENT OF WESTERN AUSTRALIA

Infrastructure Western Australia

Infrastructure WA

Major Infrastructure Proposal Assessment Subject Guide

Application of digital to infrastructure proposals

February 2025

Amendment and Review, Distribution, and Authorisation Record

Amendment and Review Record

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Distribution

This document is prepared for publication.

Authorisation Record

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Related documentation

Description / Details
Major Infrastructure Proposal Assessment Guidelines

Acknowledgement of Country

Infrastructure WA acknowledges the Traditional Custodians throughout Western Australia and their continuing connection to the land, waters and community. We pay our respects to all members of the Aboriginal communities and their cultures, and to Elders both past and present.

This is intended to be a “living” document that is continuously reviewed and improved to reflect emerging best practices, new insights, and evolving needs. We invite ongoing feedback and collaboration to ensure its relevance and effectiveness. To provide feedback and suggestions for refinement please contact IWA’s proposals team on proposals@infrastructure.wa.gov.au.

This publication can be made available in alternative formats and languages on request, please contact us.

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1. Purpose of guidance

The purpose of this subject guide (Digital Guide) is to support state agencies and government trading enterprises (GTEs), collectively called 'proponents', in the development of best-practice capital investment proposals to be considered by Infrastructure WA (IWA) as part of its Major Infrastructure Proposal Assessment (MIPA) function.

Key benefits of digitalisation and/or digitising infrastructure may include:

- **Improved outcomes**: Smart infrastructure can enhance customer engagement, personalise services and improve user interactions with built environments.
- **Productivity and efficiency**: Data and technology help to optimise the performance of assets and enable agencies to apply learnings to future infrastructure proposals.
- **Life cycle management**: Data supports the development of user-centric infrastructure, the prediction of maintenance needs, and the proactive management of assets.

The objectives of this Digital Guide are to:

- set out a digital guideline that can be considered throughout the life cycle of an infrastructure proposal's development.
- showcase local and Australian case studies that use similar concepts.
- describe benefits that can be realised when digital solutions are considered.
- identify key considerations of digital initiatives.

This guide should be read in conjunction with the MIPA Guidelines. Proponents are encouraged to engage with IWA during the early development stages of proposals.

This Digital Guide is not a static document – it will be updated as new information becomes available and feedback is received.

2. Scope of guidance

Proponents should consider the application of this Digital Guide across the entirety of the infrastructure project life cycle, including planning, design, delivery, operations, maintenance, management and end-of-life (repurposing, dismantling or disposing of assets), where applicable.

While digitisation applies to the entire infrastructure life cycle, the most significant leverage points are the investment case, procurement, construction and operation stages.

3. Applicability

This Digital Guide is relevant to proposed major infrastructure projects that will be assessed through the MIPA process. IWA's MIPA process aligns with the Strategic Asset Management Framework (SAMF) including the SAMF Business Case Guidelines. This Digital Guide aims to provide a framework for proponents to consider where, when and how to best leverage technology and data throughout the infrastructure lifecycle.

There are no mandatory requirements relating to the application of digital to government infrastructure proposals in Western Australia (WA) but proponents should consider consultation with the Office of Digital Government and consider if the 2024 WA Government Cyber Security Policy has requirements applicable to proposals on a case-by-case basis.

4. Background

Recommendation 2 of IWA's State Infrastructure Strategy 2022 (Strategy) was to improve infrastructure efficiency and performance, as well as enhance service delivery, by taking a digital-first approach to all stages of the infrastructure life cycle. This recommendation was fully supported in the WA Government response to the Strategy.

Importantly, this includes developing a digital-first infrastructure policy that guides the application of digital technologies such as:

- designing principles for digital-enabled infrastructure, such as interoperability and flexibility, resilience, open standards and user-centred design
- minimum requirements to embed smart technology in new and upgraded infrastructure, where a positive net benefit can be demonstrated
- a clear process for proponents that would identify how to assess and implement digital at all points of the life cycle, including accounting for upfront and recurring costs in the business case phase
- outcomes and metrics.

If implemented, this digital-first policy would be the first of its kind in WA. It aims to promote a standardised and best-practice approach for applying both proven and innovative digital technologies throughout the asset life cycle, from planning and delivery through to decommissioning. This should incorporate life cycle management practices that leverage digital tools to track and optimise the performance of infrastructure assets throughout their life span. It should also consider the end-of-life management plan for technology and its transformative methodology. This approach ensures sustainable and cost-effective operations.

Recommendation 2 aims to tackle the digital divide across various sectors (for example, water and transport), such as:

- how data is captured and stored
- types and versions of technology and software used
- digital maturity of agencies
- digital utilisation.

Bridging these divides through policy intervention allows agencies to embed digital-first principles (both in terms of physical asset and infrastructure planning, and delivery processes) into their business case development and strategic asset management. In turn, this may improve the efficiency and effectiveness of the management of WA’s public sector infrastructure assets across their life cycle.

5. Summary of Proposal Guidance

A summary of how proponents can consider and apply this Digital Guide to development of SAMF compliant business case s can be seen in Table 1. Table 1 also indicates opportunities for proponents to build capability towards best practice, which is continuously evolving. This list is not exhaustive, and proponents should consider application on a case-by-case basis.

Further detail on Digital guidance can be found in Section 6 and further details on integration into business cases can be found in Section 7.

Table 1: Summary and examples of potential application of Digital Guide to projects

Business Case Section	Considerations for SAMF alignment	Good Practice	Better Practice*
Project Purpose	If relevant identify the relationship between the problem / project purpose, government policies and potential digital initiatives. *e.g. where relevant include consideration of WA Government's Cyber Security Policy.*	Include consideration of any existing digital elements as part of the base case definition. Link digital considerations to proponent's Strategic Asset Plans where applicable.	Assessment of proponent's current digital capabilities as part of the base case definition. Where applicable link digital initiatives directly to the rationale for intervention, including timing of adoption if known. *e.g. identify if current digital capability requires an uplift and incorporate as a base case to allow consideration of benefits of options to uplift.*
Investment Proposal	Where applicable, integrate digital approach into project's scope and objectives. *e.g. document if a digital capability or service uplift is required to realise the benefits of the project.*	Consider and document the impact to project benefits of including digital initiatives. *e.g. where applicable incorporate digital benefits and digital responses in the Investment Logic Map.*	Detailed explanation as to how digital initiatives can improve proposal and whole-of-government outcomes. *e.g. where relevant, identify interdependencies with other government agencies includes reliance on digital initiatives (risk) or multiple agency or sector benefits from the proposal's digital initiatives.*
Strategic Options Analysis	Consider and document if benefits and outcomes of digital initiatives will form part of potential strategic options. *e.g. identify if digital criteria will form part of the shortlisting process.*	Digital options are considered and incorporated, where relevant, in the preparation of the long list. *e.g. consider and document as part of the longlist of options if there are digital alternatives to physical infrastructure*	Incorporate qualitative or quantitative assessment of digital to evaluate the longlist of project options. *e.g. utilise a quantitative digital criterion to score options as part of an MCA.*
Shortlisted Options Evaluation	Where digital is identified as a component of shortlisted options, document how differences	Where digital is included as part of shortlisted options, provide preliminary quantitative	Economic analysis including quantitative assessment of costs and benefits of digital

Business Case Section	Considerations for SAMF alignment	Good Practice	Better Practice*
	in digital adoption for the option may impact the proposal objectives. *e.g. document if implementation of smart systems, such as to manage energy use, in the operational phase is a key options differentiator.*	assessment of cost implications. *e.g. high-level cost estimate for construction and operational phases (such as % increase in capex and opex costs) of implementing the digital initiatives.*	initiatives to evaluate the shortlisted options. *e.g. incorporate monetised costs and benefits into the CBA over the lifecycle of the base case and shortlisted options.*
Implementation Analysis	If relevant, document how digital will be integrated in future delivery phases across the project lifecycle. *e.g. where relevant, incorporate reference and adherence to the Office of Digital Government guidelines.*	Document how any digital solutions might be adopted through future delivery phases. *e.g. where BIM or GIS will be utilised in development, consider if multiple use or benefits can be achieved (such as stakeholder communications and engagement or future incorporation into operator asset management systems).*	Detailed explanation of how any digital initiatives relate to procurement, risk management, governance, stakeholder engagement, and change management and consider if there are any wider benefits to distribution of data. *e.g. document where digital linkages and data transfer can occur between design, procurement, construction and operational phases and consider if transfer or publication of data can provide wider benefits (such as data sharing across agencies and platforms).*

*It is acknowledged that 'best' practice for digital is continuously evolving and expanding. The summary aims to improve business case considerations of digital to support proponents build capability towards best practice.

6. Digital guidance

Embracing digital solutions is critical for improving efficiency and increasing capacities across WA's infrastructure assets and achieving digital capability uplift across proponents. Several digital systems and applications are currently in use across Australia's various states and territories.

This Digital Guide should be read in conjunction with the *Data standards for Western Australian government*. These standards are designed to improve data sharing and common reporting across the WA Government by ensuring consistency of collection and organisation of data and metadata structures.

6.1 Digital solutions

There are several digital solutions that proponents could consider for their infrastructure proposal, depending on their applicability. Each solution seeks to save time and cost while driving innovation and improving infrastructure asset performance.

If any of these solutions are proposed by a proponent, they must be aligned with the requirements for that specific infrastructure asset. Their benefits will only be maximised if stakeholders can use the final outputs.

Building information modelling

Building information modelling (BIM) is a key component of this suite of digital solution options and acts as its foundation. The BIM process generates and manages detailed digital representations of the physical and functional properties of locations (for example, the location(s) of the proposed infrastructure), allowing for more efficient planning, design, building and management.

Implementing BIM as a process within infrastructure proposals ensures that all stakeholders will have access to correct and up-to-date information, thereby eliminating errors, executing clash detection processes, visualising safety in design methodology and eliminating rework, ultimately saving time and money.

BIM capabilities include multiple dimensions of 4D (time) and 5D (cost) into a 3D-modelling environment. This ensures the efficient planning, design, construction and management of projects.

It should be noted that there is no universally accepted standard for BIM.

Digital engineering

BIM is complemented by digital engineering. Digital engineering brings together different engineering disciplines and uses digital technologies incorporating data integration to design, build and manage the life cycle of a project. This comprehensive strategy increases cooperation, workflows and decision-making. Digital engineering can lead to more efficient project execution by facilitating real-time data sharing among stakeholders, resulting in faster projects and lower costs related with conflicts and errors.

Digitisation

Building on these foundations, digitisation entails transforming analogue data to digital representations and incorporating these digital technologies into current operations. It uses digitised information to create processes and new value. Digitisation may increase operational efficiency by allowing for better data management and accessibility.

Digital twins

Digital twins are computer models that represent physical assets. These models provide a complete, real-time view of asset performance by combining data from multiple sensors. The use of a digital twin enables virtual scenario testing, optimisation of maintenance schedules and improved overall asset management.

This process can transform infrastructure management by reducing the time and costs associated with physical inspections and trial-and-error procedures.

Internet of Things

The Internet of Things (IoT) may, with the appropriate level of investment by the Department of Treasury, enable real-time data collection and monitoring by connecting physical devices equipped with sensors and connectivity. IoT plays an essential role in infrastructure projects because it provides continuous data on asset conditions, consumption patterns and environmental factors. This data enables predictive analytics and automatic reactions, which leads to more efficient operations and maintenance.

Geographic Information System

Geographic Information System (GIS) technology is the application of location-based analytics – using the science of geographical intelligence to analyse multiple, complex datasets layered over defined territories, revealing hidden trends and patterns.

6.2 Key considerations

Data governance

Effective data governance is essential for the success of modern digital technologies. Robust data governance frameworks ensure that data assets are handled officially and consistently, increasing the reliability and quality of data in infrastructure initiatives. Table 2 contains key considerations for the application of a digital framework to infrastructure proposals.

Table 2: Key considerations for the application of a digital framework to infrastructure proposals

Key considerations	Potential outcomes	Possible focus areas
Whole-of-life cycle management	• Extended life span of infrastructure assets • Optimised maintenance and operational costs • Sustainable and resilient infrastructure development • Improved resource allocation	• Implementing life cycle asset management practices • Utilising data for predictive maintenance • Integrating sustainability in infrastructure planning • Continuously monitoring and improving asset performance
Connected ecosystems	• Seamless integration of various infrastructure systems • Improved collaboration across different sectors • Enhanced data sharing and interoperability • Creation of smart cities and communities	• Building robust information technology (and operational technology networks • Developing common data environments

Key considerations	Potential outcomes	Possible focus areas
Data management and interoperability	• Cross-jurisdictional data management standards and metadata requirements • Retention of disposal of data and information by third-party vendors. • Enhanced efficiency and productivity in operations, data exchange and interoperability • Real-time data collection and analysis • Improved decision-making through data-driven insights • Cost savings through optimised processes	• Standardising digital protocols early in the project planning phase • Considering data transfer and management protocols • Implementing advanced digital technologies (e.g. IoT, AI, ML) • Upgrading legacy systems • Investing in digital skills and training for the workforce
Secure, intuitive AI and trusted services	• Increased trust and reliability of digital services • Enhanced security and data protection • User-friendly interfaces and improved user experience • Proactive risk management	• Strengthening cybersecurity measures • Developing AI-driven solutions for predictive analytics • Ensuring compliance with data protection regulations • Enhancing user interface design and user experience
Ease of utilisation based on user experience	• Increased user satisfaction and adoption rates • Simplified access to services and information • Enhanced productivity through intuitive interfaces • Reduced training and support costs after establishment phase	• Designing user-centric interfaces • Conducting user experience research and testing • Streamlining service processes • Providing comprehensive user support and training materials

Notes: IoT – Internet of Things; AI – artificial intelligence; ML – machine learning

7. Business case integration

Consistent with broader business case expectations, where appropriate, the level of detail provided by proponents on digital initiatives is expected to be proportionate to the size and complexity of the proposal and to align with the structure set out in the Strategic Asset Management Framework (SAMF) Business Case Guidelines (Figure 1).

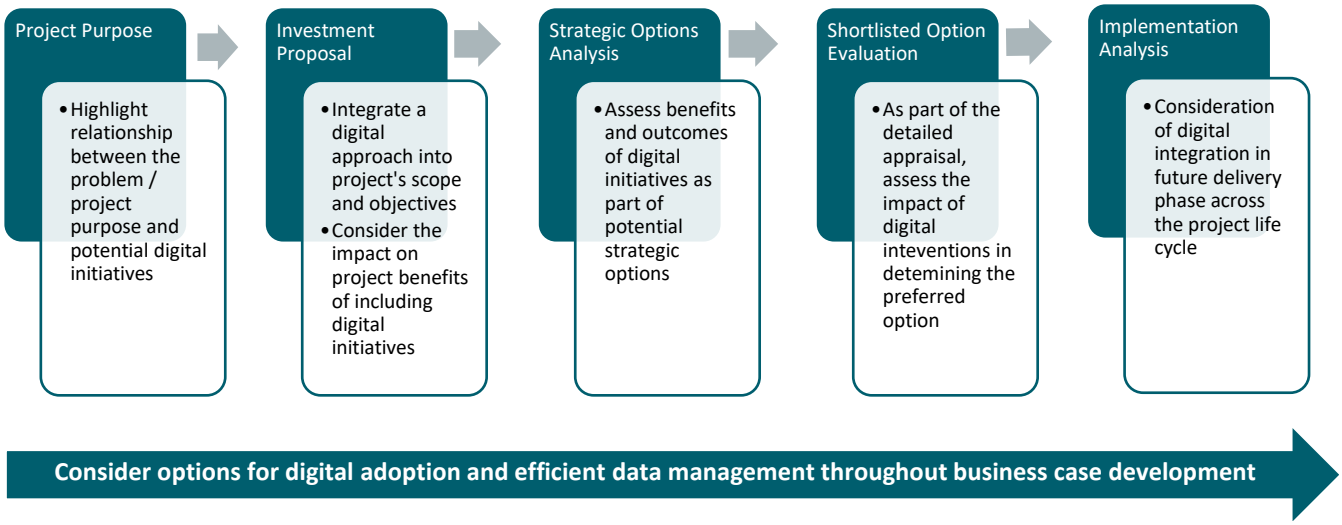

Figure 1: Digital integration with the SAMF Business Case Guidelines

The following sections detail the opportunities for integration of digital initiatives within each of the business case sections shown in Figure 1. As far as possible, these align with and address the subsections of each business case section in the SAMF Business Case Guidelines (Figure 2).

Figure 2: Overview of requirements in the SAMF Business Case Guidelines

7.1 Project purpose

This section provides an opportunity to incorporate potential digital initiatives as part of defining the strategic context and developing the problem/opportunity statements. This could be done in several ways.

Problem definition

While defining a set of problem/opportunity statements that the proposal intends to address, consider digital initiatives that could be explored further in the preparation of the business case.

Rationale for intervention

Outline how the inclusion of digital initiatives in the proposal could contribute to achieving the proponent's and the WA Government's broader strategic and policy objectives, including those outlined in the:

- SAMF Business Case Guidelines
- Strategic asset plans
- State Infrastructure Strategy
- Digital Strategy for the Western Australian Government 2021–2025
- MIPA Guidelines.

Within the definition of the base case where appropriate, include:

- an assessment of the current state of the proponent's digital capabilities
- an identification of the proponent's current gaps in technology, skills and processes as they relate to the project purpose.

Digital initiatives that might help resolve these gaps could support the rationale for government intervention.

7.2 Investment proposal

This section requires proponents to define the investment logic of the planned investment by linking the problem statement and proposal objectives to the relevant benefits. It could include a consideration of the implications and interdependencies of incorporating digital initiatives within the scope of potential strategic responses.

Business case objective

Set an objective for the inclusion of digital initiatives as part of the project objectives. If there is potential for digital initiatives to assist in achieving the project goals and broader proponent and state priorities, this inclusion could be revised to a specific target, depending on the maturity of the proponent. When setting targets, the proponent should consider alignment with digital ambitions set by government or comparable agencies, industry bodies or projects, while having regard for trade-offs between digital advancement and additional costs.

Consider the cost and time implications of the inclusion of digital initiatives.

Stakeholders

Consider the interfaces with internal and external stakeholders. For example:

- interface with external data sources, such as contractors, supply chains and consultants
- potential partnerships with vendors and consultants to maximise benefits.

Interdependencies

Identify the interdependencies between digital initiatives and other aspects of the proposal / external context. Discuss how digital initiatives may interact with and support other project components and address potential synergies or conflicts with existing systems and processes.

7.3 Strategic options analysis

This section typically involves identifying a longlist of options, followed by a qualitative or quantitative assessment to reduce this to a shortlist. As part of the options identification process, proponents could investigate digital interventions that might address the problem and achieve the desired benefits. This could take the form of a standalone digital or the inclusion of digital initiatives in the broader strategic options.

Generate long list of options

Package the digitally enabled asset interventions into a set of strategic responses that correspond with the problem/opportunity statements. Rank these responses by benefit delivery, risks, dis-benefits, costs and timeframes. Use the rankings to create a longlist of options.

Looking at the strategic responses, highlight the data applications in the context of the industry in which the project may operate and be managed. Industry-specific examples include:

- **Transport and utilities**: 3D drawings and digital mapping of utilities
- **Decarbonisation**: sustainability analysis, simulations of energy efficiency and water consumption, heat maps of a dedicated geographical area
- **Arts, culture, sport and recreation**: digitisation of customer experience planning.

Shortlisting of options

Proponents may conduct a multi-criteria analysis to create a shortlist. This analysis could include digital criteria, such as scalability, interoperability, user adoption and alignment with strategic goals.

7.4 Shortlisted options evaluation

This section involves a series of detailed analyses to assess the shortlisted options and make a recommendation. As part of the economic and financial analyses, the proponent should outline the costs, benefits and other impacts of the digital components of the shortlisted options and consider these when making a recommendation.

This process may include the following steps:

- Capture the costs and quantitative and/or qualitative benefits of implementing the digital initiatives in the shortlisted options. Examples of costs and benefits are shown in Table 3. It is noted that this is not an exhaustive list and proponents should consider costs and benefits on a project specific basis.
- Compare the costs to the expected benefits to deliver a value-for-money assessment of the digital initiative.

Table 3: Examples of costs and benefits of a digital initiative

Costs	Benefits
Upfront (capital) costs • Acquiring a digital solution • Data compilation • Implementation • Integration • Training and education **Ongoing costs** • Licencing fees • Maintenance • Periodic upgrades	• Efficiency gains (e.g. in the delivery of the project and ultimate delivery of government infrastructure and services over the life cycle) • Faster processes (e.g. digital planning approvals) • Improved information accuracy • Lower life cycle (operations and maintenance) costs (e.g. optimisation of energy and resource use, improved asset management/performance) • Improved information security • More accurate assessment of environmental risk • Enhanced service delivery through higher quality and/or more customer-focused infrastructure and services • Improved safety

Benefit estimation and quantification is a complex process, especially for digital initiatives, which are still a developing area for most agencies and in most jurisdictions. This kind of analysis is typically conducted through economic and financial appraisals, such as:

- cost-benefit analysis
- sensitivity analysis
- financial appraisal (NPV and IRR)
- financial impact statement.

Where most or all of the benefits cannot be quantified, an alternative economic analysis approach, such as cost-effectiveness analysis, should be considered. Costs and benefits that cannot be quantified should be assessed qualitatively in the supporting narrative.

Existing methodologies and guidelines are limited in this area. A suggested starting point is the NSW Government Digital CBA Addendum, which assists development of business cases to articulate the costs and benefits of a digital initiative. Proponents may wish to seek specialist economic advice (from the WA Government or externally) to assist with this process.

7.5 Implementation analysis

This section requires the proponent to describe how they would implement and deliver their preferred option effectively. The following issues must be considered.

Procurement strategy

Consider whether the digital component needs to be procured separately to the remainder of the proposal. Determine if specialist expertise or knowledge is needed to manage procurement or any subsequent contract. Investigate whether the market currently has sufficient capability and capacity to provide the preferred option. Evaluate the allocated funds and time allowed for procurement to see if they are realistic.

Implementation

Evaluate the organisational impact and the proponent's readiness to implement the preferred digital component. Assess its potential impact on the proponent's structure, culture and existing processes and technologies. Evaluate the workforce's readiness to adopt and integrate this new digital technology.

Information and data management

Describe what steps would be taken to adequately prepare for information and data management. This might include:

- implementing data governance frameworks to ensure consistent data quality, integrity and security to effectively manage any cyber-security risks.
- developing protocols for data integration, storage and usage to support ongoing operational efficiency.

Proposals must follow Office of Digital Government guidelines, including the 2024 WA Government Cyber Security Policy.

Training

Outline the training and education programs that would be developed to address the varying levels of digital literacy in the workforce, including cyber-security. This might include:

- building organisational capability around sustainable change and risk management to ensure that the benefits of digitisation are realised
- developing learning pathways to accelerate capability building
- providing ongoing professional development opportunities to equip employees with the necessary digital skills and knowledge
- Fostering a culture of continuous learning and innovation to support the successful adoption of digital technologies
- bridging the divide between asset management and IT.

Risk management

Digital projects are the most likely to run over budget and over time. Identify and assess the risks associated with digital initiatives within the preferred option. This might include:

- identifying potential risks, such as cybersecurity threats, data privacy issues and implementation challenges
- ensuring data is stored in government-wide, systematic and secure frameworks
- ensuring digitisation efforts are proportionate to the level of investment and benefits
- ensuring connection of the digital initiative with the purpose of the built asset (where applicable) and the intended outcomes
- developing mitigation strategies to address these risks throughout the project life cycle.

8. Case studies

8.1 METRONET (WA)

METRONET is a portfolio of works to deliver over 70 kilometres of new rail and 23 new train stations across the Perth metropolitan area. The portfolio included over 15 major infrastructure projects that had to integrate and interface with each other and a significant number of partner agency organisations, including the Department of Transport; Public Transport Authority; Department of Planning, Lands and Heritage; Main Roads Western Australia; Department of Communities; and Development WA.

To facilitate effective communication and collaboration of design from the outset, all design information was undertaken and consolidated in 3D models. This allowed project teams to share models with other projects and stakeholders during the design process, and identify and mitigate the risks of clashing with existing infrastructure. Congested areas were identified early, and the 3D models were used to discuss and communicate options with third-party utilities providers in advance of construction to achieve the best outcomes.

Detailed 3D digital models also allowed effective design interfacing between projects. There were instances in the network where one project was responsible for a precinct and another was responsible for the rail alignment and railway systems. In these cases, the projects combined their models to ensure continuity of design and to confirm there was enough space for future requirements for rail systems. These models also identified technical challenges and highlighted areas between projects that had previously been undefined. Interfacing projects routinely conducted interdisciplinary design reviews where tie-in points for rail systems, structures and alignments could be identified and agreed on.

Throughout construction, asset data was appended to design models, producing a model that aligned with the asset operators' information requirements. Data was structured so it could be extracted from the models and input directly to each operator's asset management system, facilitating ongoing asset maintenance during the operations phase.

A summary is contained in Table 4.

Table 4: METRONET summary

Applications	Enablers and drivers	Key benefits	Lessons learned
• Integration between projects • Collaborative design development process • Data rich asset information models • VR sessions with stakeholders to communicate design	• Clear client requirements around data and information delivery • Digitally mature supply chain that was comfortable working in a 3D environment • Open communication between projects using shared design models	• **Centralisation:** Consolidation of many design models into a single federated model • **Strategic planning:** For example, identifying requirements for third-party utilities relocations in advance	• **Efficiency through data re-use:** Data collected in the early stages of the project (e.g. survey, GIS, topography, hydrology) was reused throughout the design development and became the baseline for the as-constructed information at the end of the construction phase • **Risk mitigation**: Clear understanding of the project design reduced the risk of costly rework or redesign

8.2 Digital replica of Auckland Airport

As part of a 30-year development plan, Auckland Airport worked with survey partners to use laser-scanning technology to capture the airport's existing terminal infrastructure. They created a detailed BIM model that included the existing main terminal building, plus a survey control network over the entire airport campus.

This is an approach that is used to design complex infrastructure projects, and to create baseline data that is used to manage and maintain the asset throughout its life cycle. It pulls together data and information that might otherwise have been held within different teams across the business. It does not employ a single software application. Instead, designers, consultants and construction teams are encouraged to use the tools that best suit their industry needs. This ensures that consultants and contractors are able to innovate or try new applications and keep pace with the rapid development that is taking place within this relatively new industry.

At Auckland Airport, this accurate digital foundation was used to reduce risk during the development of a new runway, two new terminals, and all the support services that accompanied the expansion. The aim was to make survey data accessible to everyone and provide a common reference system that engineers, surveyors and planners could use to create digital models and activate expansion plans in the future. This survey network has allowed all spatial information to be joined, linked and accurately referenced together into one common spatial system. It has reduced risk and costs, and provided greater certainty of spatial building and topographical information.

All the key assets are being developed to create what will eventually become an extremely detailed and accurate digital replica of the airport. This 3D digital picture of the international and domestic terminals will be available anywhere and anytime for anyone who needs a better understanding of the assets.

The project has received a prestigious international award. The judges commended Auckland Airport on the way the models have been developed – incrementally adding and benefiting from small gains rather than over-reaching and becoming bogged down in complexity.

A summary is contained in Table 5.

Table 5: Auckland Airport summary

Applications	Enablers and drivers	Key benefits	Lessons learned

• Ability to plan for future expansions
• Asset and facility management
• Standardisation tool
	• Centralised common reference system for all users
	• Data is accessible and useable for all areas of expertise
	• Technologies:
	  • digital survey
	  • laser scanning
	  • 3D animated reconstruction
	  • software agnostic system
		• **Centralisation:** Data that would otherwise be siloed was collected into one reliable source
		• **Strategic planning:** Assisting prioritisation of planning new projects based on insights from digital twin
		• **Collaboration:** Accessible to all stakeholders, encouraging collaboration and teamwork
		• **Risk reduction:** Insights into the impact of decisions provides more certainty and reduces development risk
			• **Communication:** Assist and educate other suppliers in how to use the digital model and establish best-practice use
			• **Modularity:** New assets can be added as they are built
			• **Plan for the future:** Careful planning for future capabilities to ensure success of the digital twin

8.3 Digital Twin Victoria program

The Digital Twin Victoria (DTV) program will fast track the adoption of new geospatial data and emerging technologies. DTV consolidates open datasets from across the public sector into one easy-to-use platform, making better use of existing digital assets and enabling smarter data-driven decision-making. Thousands of open datasets from across Australia, Victoria and local government agencies are already available on the platform, with more to come.

DTV will enable both government and non-government stakeholders to support the visualisation of 3D and 4D spatial data and act as foundational infrastructure for the development and integration of features and functions used to inform policy development and other decisions. It consists of 7 inter-related workstreams: Advanced Earth Observation, Enhanced Disaster Response, Digital Twin Utilities, Digital Twins for Asset Management, Faster Subdivision Registration, Automated Approvals and Digital Twin Platform.

Economic benefit estimation and management was a challenging process for the DTV project. Ultimately, benefits were identified either accruing to government or industry and classified into various workstreams, including:

- cost savings to government from easier and faster access to data and the reduction of duplicated data acquisition
- cost savings from government use of the Vicmap Address Validation application programming interface
- cost savings to local government from reduced time and effort for the examination process of land subdivision registration, and the review and approval of small lot housing code building applications
- reduced statutory approval timeframes for building approvals
- reduced industry holding costs
- cost savings from reduced effort associated with early utilities consultation and desktop investigation through to final completion
- reduced costs for undertaking potholing and surveys on site
- cost savings related to reduced effort for handover and validation of as-built asset data.

Benefits were then quantified through the use of novel approaches.

A summary is contained in Table 6.

Table 6: Digital Twin Victoria summary

Applications	Enablers and drivers	Key benefits	Lessons learned
• Supporting delivery of construction and infrastructure • Compliance monitoring • Increased communication and engagement with community	• Various functions and use cases were introduced to the spatial platform to act as the foundational ground • 3D and 4D spatial data capabilities • Technology: TerriaJS	• **Time savings:** Better and faster delivery, resulting in time-saving decisions • **Collaboration:** Open-source platform and easy-to-use interface promotes teamwork and provides a single reliable source of information	• **Multi-faceted benefits:** Ability to add layers of information that is accessible to a range of stakeholders, serving various purposes depending on the use case and applications • **User-centric design:** Users should want to continue using the platform/technology

9. Definitions

Term	Definition
Artificial intelligence	The application of advanced analysis and logic-based techniques, including machine learning, to interpret events, support and automate decisions, and take actions.
Building information modelling	A digital form of construction and asset operations that brings together technology, process improvements and digital information to radically improve client and project outcomes and asset operations. BIM is a strategic enabler for improving decision-making for both buildings and public infrastructure assets across the whole life cycle. It applies to new build projects and also supports the renovation, refurbishment and maintenance of the built environment.
Common data environment	A single source of information used to collect, manage and disseminate documentation, the graphical model and non-graphical data for a whole project team.
Customer relationship management	A technology for managing company's relationships and interactions with customers and potential customers.
Cybersecurity	The people, policies, processes and technologies employed by an enterprise to protect its digital assets.
Digital engineering	A collaborative way of working using digital processes to enable more productive methods of planning, designing, constructing, operating and maintaining assets through their life cycle.
Digital twin	A digital representation of a real-world entity or system.
Digitalisation	The use of digital technologies to change a business model and provide new revenue and value-producing opportunities. It is the process of moving to a digital business.
Digitisation	The conversion of hard-copy or non-digital records into digital format. It can involve taking digital photographs of original records or scanning (imaging) records.
Enterprise resource planning	A software system that helps run an entire business, supporting automation and processes in finance, human resources, manufacturing, supply chain, services, procurement and more.
Information technology	The entire spectrum of technologies for information processing, including software, hardware, communications technologies and related services.
Internet of Things	A network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment.
Machine learning	Includes many technologies (such as deep learning, neural networks and natural language processing) used in unsupervised and supervised learning, that operate guided by lessons from existing information.
Operational technology	Hardware and software that detects or causes a change, through the direct monitoring and/or control of industrial equipment, assets, processes and events.

10. Further information

NATSPEC, BIM Value tool

Digital NSW, Addendum to cost benefit analysis template, NSW Government, 2023

Infrastructure WA, Foundations for a stronger tomorrow: State Infrastructure Strategy, WA Government, 2022

ISO, ISO 19650-1:2018 – Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling: Part 1: Concepts and Principles 2018

ISO, ISO 19650-2:2018 - Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling: Part 2: Delivery phase of the assets

ISO, ISO 19650.3:2021 - Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling: Part 3: Operational phase of the assets

ISO, ISO 19650-4:2022 - Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling: Part 4: Information Exchange

ISO, ISO 19650-5:2020 - Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling: Part 5: Security-minded approach to information management

GOVERNMENT OF WESTERN AUSTRALIA

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