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DIGITAL GUIDANCE SUITE:  
AOTEAROA | NEW ZEALAND 2023

The Value Case for 'Digital First'

# APPENDIX 1

# CASE STUDIES

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Aotearoa New Zealand's 'digital first' strategy for the built environment sector can benefit from case studies undertaken both internationally and nationally. Knowledge can be leveraged practically and pragmatically to chart a path to success that is right for the local construction and infrastructure industry. Lessons can be learned from the United Kingdom, Australia, and Scandinavia as listed below in no particular order. Local lessons from New Zealand are also included.

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# 1 – CASE STUDIES

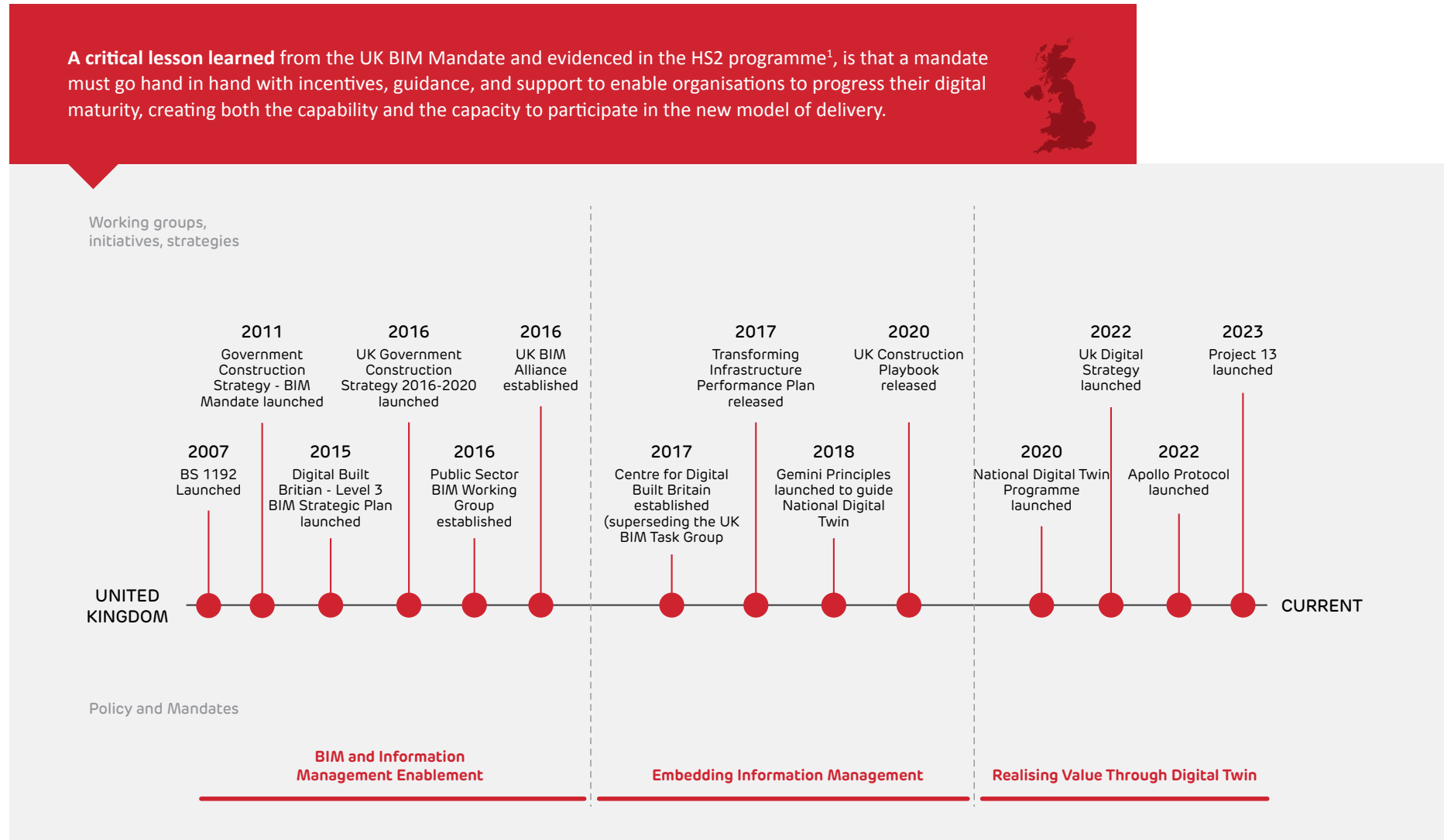
## UNITED KINGDOM CASE STUDIES

In 2011 the British Government embarked on a significant programme of work, mandating Building Information Modelling (BIM) Level 2 for all public sector projects from April 2016. This mandate aimed to accelerate the adoption of digital tools to unlock efficiencies across the construction supply chain – streamlining communication, breaking down silos, promoting transparency, and encouraging collaboration.

The impacts of this programme have been widely cited, and the resultant BS1192 standard for BIM was broadly adopted in many countries until it was superseded in 2018 by the international standard BS EN ISO 19650. With the release of this standard, it became clear that the focus must be on all forms of information and its lifecycle management, not simply BIM models.

In 2023 the UK adopted the term Digital Engineering (DE) for information sharing. The timeline on the following page shows the decade-long programme of investment and policy development that supports its digitisation approach.

**A critical lesson learned** from the UK BIM Mandate and evidenced in the HS2 programme<sup>1</sup>, is that a mandate must go hand in hand with incentives, guidance, and support to enable organisations to progress their digital maturity, creating both the capability and the capacity to participate in the new model of delivery.



<sup>1</sup> See: <https://www.hs2.org.uk/building-hs2/innovation/digital-engineering-and-bim/>

### AUSTRALIA CASE STUDIES

Australia has reaped the rewards of learnings from the UK BIM programme. Beginning with policy and guidance relating to the adoption of BIM, the conversation has evolved more recently into the adoption of DE – supported by policy and leadership at industry and regional levels.

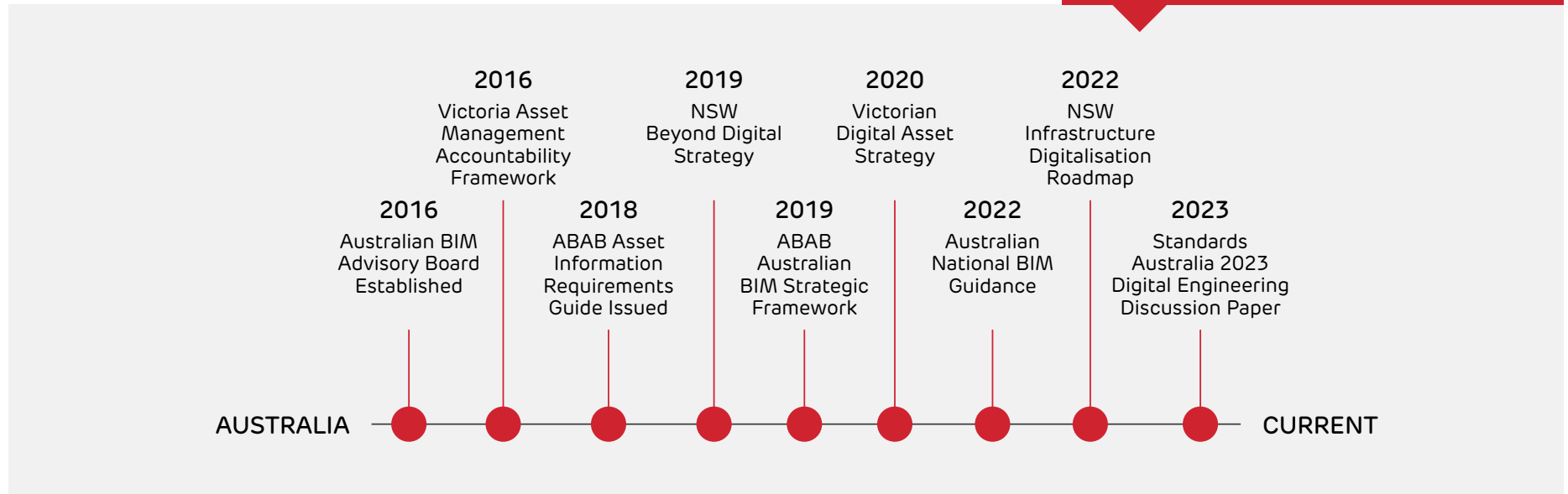
Recent policies published by Standards Australia set out a clear vision for leveraging a digital environment to bring individual state-led approaches closer together. A 'digital first' approach underpins significant regional policies, including the Victorian Digital Asset Strategy, in which an asset-management accountability framework for decision-

making provides the methodology for the way that built environment assets are planned, delivered and operated. This approach also provides the foundations for a Digital Twin of the state of Victoria.

The diagram below sets out key documentation, policies and guidance developed across Australia. There is a significant amount of organisational and project-level documentation from recognised industry leaders such as Transport for NSW, the Victorian Government, and Cross River Rail to encourage uptake.



**A critical learning** is the process of sharing learnings collaboratively across organisations in both the private and public sectors, across states and within regions.



## SCANDINAVIA CASE STUDIES

### NORWAY

There are two key 'digital first' projects in Norway to learn from: Stavanger University Hospital and the Norwegian Government Headquarters, according to Bridget White of the Nordic Office of Architecture.

The Hospital<sup>2</sup> project is paperless, but not drawing-less because of the constraints of software. The project was a modular build, with structured parameter delivery, and used BIM for all communication between consultants and the building site. A centralised Project Information Management System (PIMS) was used for coordinating data transfer. Interoperability was key, and a lot of routines were created for automating repetition and file sharing.

Multiple digital models were created for different sections of the hospital, for quality control routines, and for scanning after completion. Every export was automated, using routines for creating digital objects that are not possible to produce in open-source conditions using Industry Foundation Class (IFC) open data standards. Note that in Norway there is a demand to produce digital deliveries in IFC open-source standards.

The Norwegian Government Headquarters<sup>3</sup> project has very high security clearance, so all data is stored offline, resulting in some difficult software choices. The project was designed and delivered using 'digital first' to be built directly from the digital model.

All the construction details were also built up in digital models, with automation used to ensure quality control. Digital tablets are currently being used on site for the construction phase, instead of paper drawings. Active management of the BIM environment is in the process of being confirmed for ongoing facilities management once the build is completed.

### FINLAND

In 2007, the Finnish Government's real estate arm, Senate Properties developed their first guidelines setting the expectations for BIM use on public projects.

These were world leading and in 2012 were developed further into a national BIM guidelines document.

It developed 12 documents for various industry roles with clear expectations for digital models.

The suite of information provided detailed guidance, without enforcement from regulation or a political mandate.

The Finnish Government's tactic was to ask industry to reference these documents, then support their uptake by providing funding and information to industry alongside encouraging their use and aligning them with international standards (such as IFC open data standards).

**Critical learnings** are that every actor must be on board with a digital strategy, and that the 'single source of truth' concept is essential for successful paper-less delivery on site.



**A critical learning** is that the useful part of document design enables a user to differentiate between mandatory and optional items for modelling at different project phases, so they are easy to refer to or copy and paste into project documentation.



<sup>2</sup> See: <https://nordicarch.com/project/stavanger-university-hospital> and <https://helse-stavanger.no/om-oss/nye-sus/teknologi>

<sup>3</sup> See: <https://nordicarch.com/project/new-government-quarter> and <https://dok.statsbygg.no/wp-content/uploads/2020/05/handoutGB.pdf>

## NEW ZEALAND CASE STUDIES

### CITY RAIL LINK (CRL)

BIM has been used extensively in the CRL project in Auckland to improve the performance of the project for all stakeholders. BIM has optimised all aspects of the project, which includes challenges such as working underground and in constrained spaces, complex services requirements, a tightly bounded urban environment, and the continued occupation and use of connected and surrounding facilities.

CRL uses a whole-of-life process that considers the TOTEX (combined Opex + Capex) over a 30-year period post-contract, including the ongoing maintenance programme. This process adds considerable value to the safety in design and maintainability, as well as equipment selection. One of the challenges for asset owners in adopting BIM is the continual operating costs, or Opex, for updating models over time.

Visualisations based on the BIM model are used to simulate day-to-day operation and use, as well as respond to emergency situations. It allows potential hazards and conflicts to be identified and mitigated before they occur in the construction process and during the operation of the facilities. It also provides the basis for material to assist train drivers and other key stakeholders to become familiar with the environment.

**A critical learning** is that BIM has streamlined the development of design reviews, public consultations, and wider communications, improving the quality and efficiency of problem-solving and decision-making on the project.





## KIWIRAIL

KiwiRail began its 'digital first' journey through project leadership. Through piloting a 'digital first' approach in the Trentham to Upper Hutt Double Tracking Project, KiwiRail mobilised the supply chain around a common goal: digital delivery across the full project, supported by lifecycle collaboration.

These goals were paired with tangible initiatives on which the project participants focused, such as 'digital shields' to support safety and productivity among drivers, and 'digital first' to reduce reliance on paper-based activities.

An important component is a commitment to the digital maturity journey and sharing knowledge across the industry. All documentation and policies are made freely available, with the intent that the journey be shared, and value recognised, by other organisations in a similar way for the benefit of the nation.

The key organisational measures and metrics include:

- Achieving 30% productivity gains when using digital shields on a project.
- Enabling 5-20% cost savings from a reduction in rework and time delays through robust, digitally coordinated designs.
- Encouraging investment in good information management capability: for every \$1 spent there is an expectation of \$5 in direct cost savings.
- Improving the cycle time for the receipt of handover asset information and streamlining the costs associated with data validation, so the information is ready sooner for the maintenance and operations of the asset. On a \$400m project this indicates savings of around \$8-16m and around six-months or more in time.

Machine Avoidance



Geo Fencing

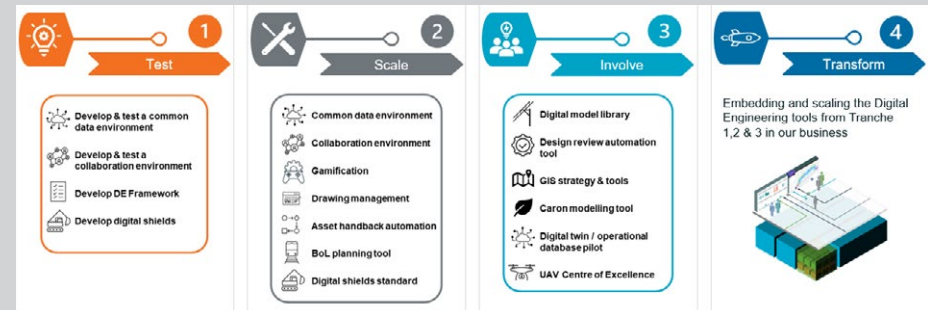




**Critical learnings and specific value were delivered at these project levels:**

- The Digital Shields project is a practical showcase of the way digital practices are shaping and de-risking construction delivery for issues such as safety and productivity.
- The Cyclone Recovery GIS Damage Assessment App showcased the efficacy of geospatial technology in emergency situations, and later contributed to increased awareness and interest among business-as-usual teams and senior management. The swift implementation and smooth data collection process worked well, highlighting the benefits of geospatial technology in a crisis situation.
- A standardised data handling process, with an online viewer and an Asset Data Handback App, was aimed at enhancing data quality and streamlining efficiency in asset handovers from capital project execution to business operations. It is to channel vital information back to the people responsible for maintenance, operations, and asset management. The key takeaways were the importance of engaging early with the parts of the business that maintained and operated assets (signals, overhead lines, tracks).
- Gamification projects, such as the Hillside workshop project, Wairarapa line upgrades project and Remutaka Tunnel project, demonstrated time and cost savings can be achieved by validating designs and avoiding rework, and by improving engagement with both internal and external stakeholders. Realistic and user-friendly simulations served as valuable assets in improving rail services and the user experience, enabled better decision-making and fostered collaboration between teams and stakeholders.

Programme Plan



Damage Assessment App