BIM BETTER BUILDING PROCESS. BUILDING BETTER PERFORMANCE.

CASE STUDY:

NZDF Gymnasium

V2 (2019)

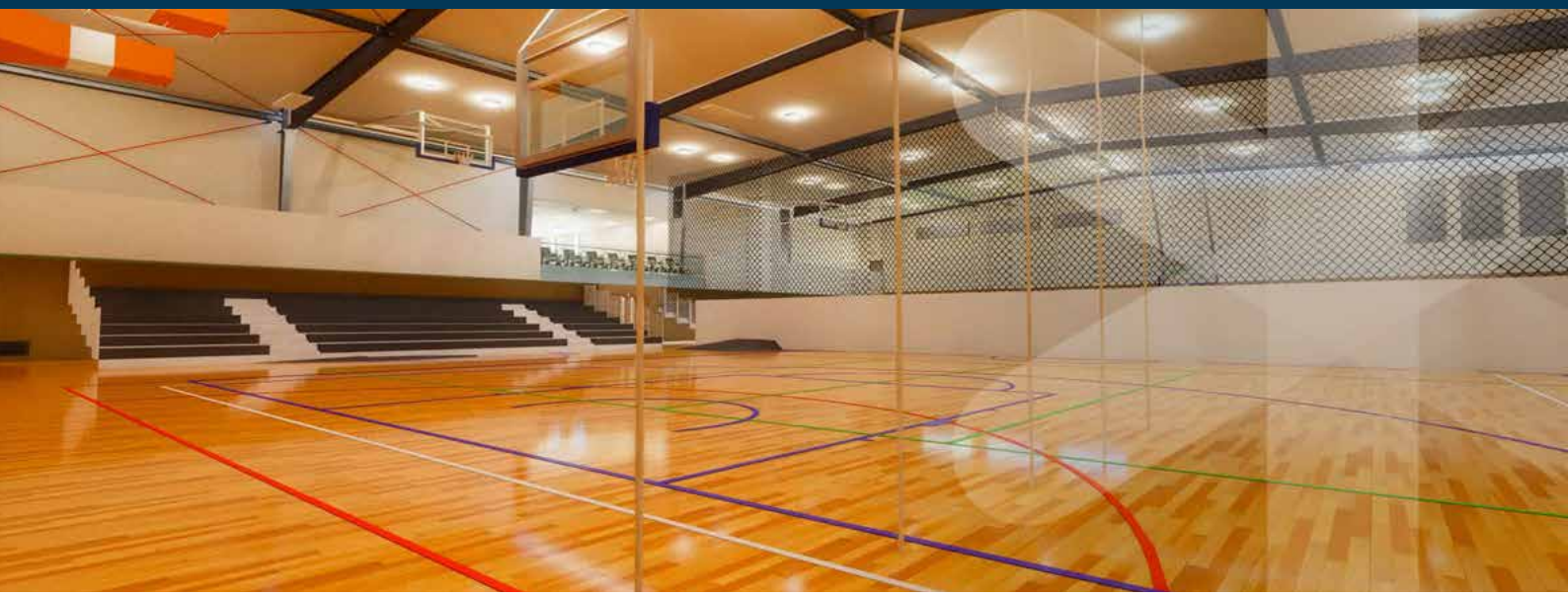
New Zealand DEFENCE FORCE Te Ope Kātua O Aotearoa

WSP | OPUS

BIM ACCELERATION COMMITTEE

BRANZ Funded by Building Research Levy

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT HĪKINA WHAKATUTUKI



WHAT IS BIM?

Building Information Modelling (BIM) is a digital representation of the physical and functional characteristics of a built asset – everything from bridges to buildings. A building information model is a shared knowledge resource for information about a facility, forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.

The key principle is that BIM is not any single act or process. It is not creating a 3D model in isolation from others or utilising computer-based fabrication. It involves being aware of the information needs of others as you undertake your part of the process.

BIM and the magic of metadata standards

NZDF adopts BIM to streamline design and construction of gymnasium; metadata standards keep BIM model manageable

Defence personnel must be ready for combat 24/7. NZDF's new gymnasium, located on the RNZAF base in Whenuapai, Auckland, will keep everyone in fighting shape. In a first for NZDF building projects, the project team applied BIM processes to building design and construction. With data the lifeblood of BIM, metadata standards informed data capture and set the stage for pain-free data sharing between models and project partners.

When BIM is applied to design and construction projects, stakeholders expect to work with rich standardised information throughout the lifecycle of the project. A BIM execution plan sets the boundary on how the project will be executed, monitored, and organised – if you like, defining just how much BIM is being purchased.

With common authenticated data the defining feature of a smoothly-run BIM project, managers must apply metadata standards to ensure project partners can extract, transfer, and share trustworthy data, quickly and simply.

The project team overseeing the design and construction of a NZDF gymnasium on the RNZAF base in Whenuapai, Auckland, embraced BIM as a project management tool to track documentation and establish a common data environment for the new asset.

Defining metadata standards proved challenging work, necessitating a search of international precedents and the development of a metadata survey tool to determine information requirements.

"There is a long menu list of things you can grab – but it's hard to determine what exactly you need. So you've got to be pragmatic and apply the attributes that make sense – and ignore everything else."

DANIEL JURGENS, PROJECT LEAD AND TECHNICAL DIRECTOR, DIGITAL ENGINEERING AT WSP-OPUS

PROJECT DETAILS

DURATION
2016 – 2019.

DETAIL
BIM streamlines design and construction of NZDF gymnasium; metadata standards keep BIM model manageable.

PROJECT PARTNERS
WSP-Opus

BIM USES
The New Zealand BIM Handbook Appendix D defines 21 distinct BIM uses. For this project the primary BIM uses include:

Design review
Design authoring
3D coordination
Asset management

The process

3D modelling software worked at the project centre, from which documents, plans, elevations, and schedules were extracted to support project disciplines. Project partners, including subcontractors, downloaded metadata to Microsoft Excel, where it was reviewed and amended for export back to the BIM model. Controlled access ensured data travelling between the model and various Excel spreadsheets followed an orderly sequence, preserving a single authenticated version of the truth.

Leading up to the BIM execution plan, consultant WSP-Opus reviewed a number of global standards and methodologies to guide the classification of building elements and the formation of a common data environment, eventually settling on BIM Level 2 nomenclature.

Data identifiers including FLOC (functional location) structures, GUID (global unique identifier) and Uniformat standards ensured each object in the BIM model remained glued to the right information. The approach offered what is essentially a barcode system to facilitate data transfer and manipulation in Excel.

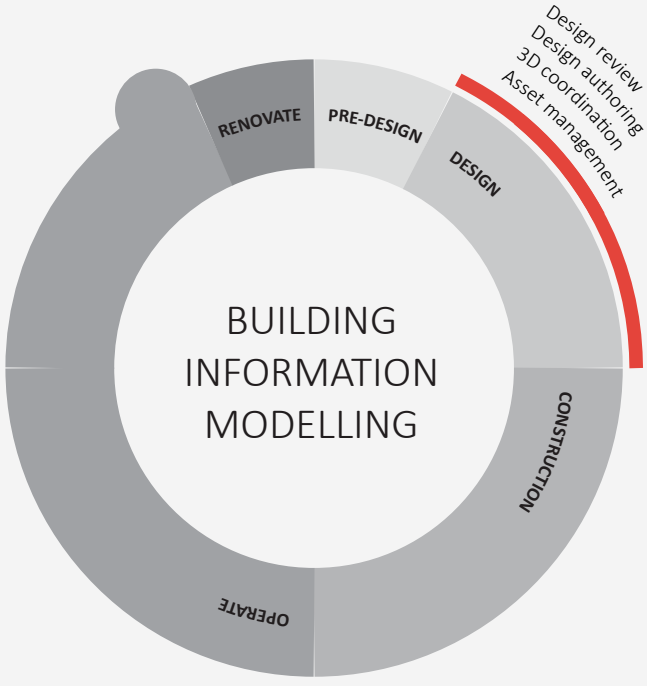
However, the initial stages of establishing data standards wasn't all plain sailing, with insufficient regard to organisational and asset information requirements producing a heavyweight data set, including 32 tables, each with numerous data entry points, and a long list of metadata requirements – which didn't align with international precedents.

WHAT IS A BIM USE?

"BIM Use – a unique task or procedure on a project which can benefit from the application and integration of BIM into that process."

THE NEW ZEALAND BIM HANDBOOK.

THIS CASE STUDY HIGHLIGHTS THE VALUE OF USING BIM IN THE DESIGN STAGE OF THE PROJECT LIFE CYCLE.



Looking to shrink the pool of BIM data, the project team used a Microsoft Access database to compare data standards from around the globe, applying the New Zealand Asset Metadata Standard – Residential Housing and Light Commercial Buildings Volume 1 As-constructed/As-built – only when an international precedent didn't exist. But it wasn't enough, so the team hatched another plan, creating a metadata survey tool to narrow information required for certain objects, in the process reducing the volume of information, and effectively eliminating thousands of line items from spreadsheets.

Challenges and constraints

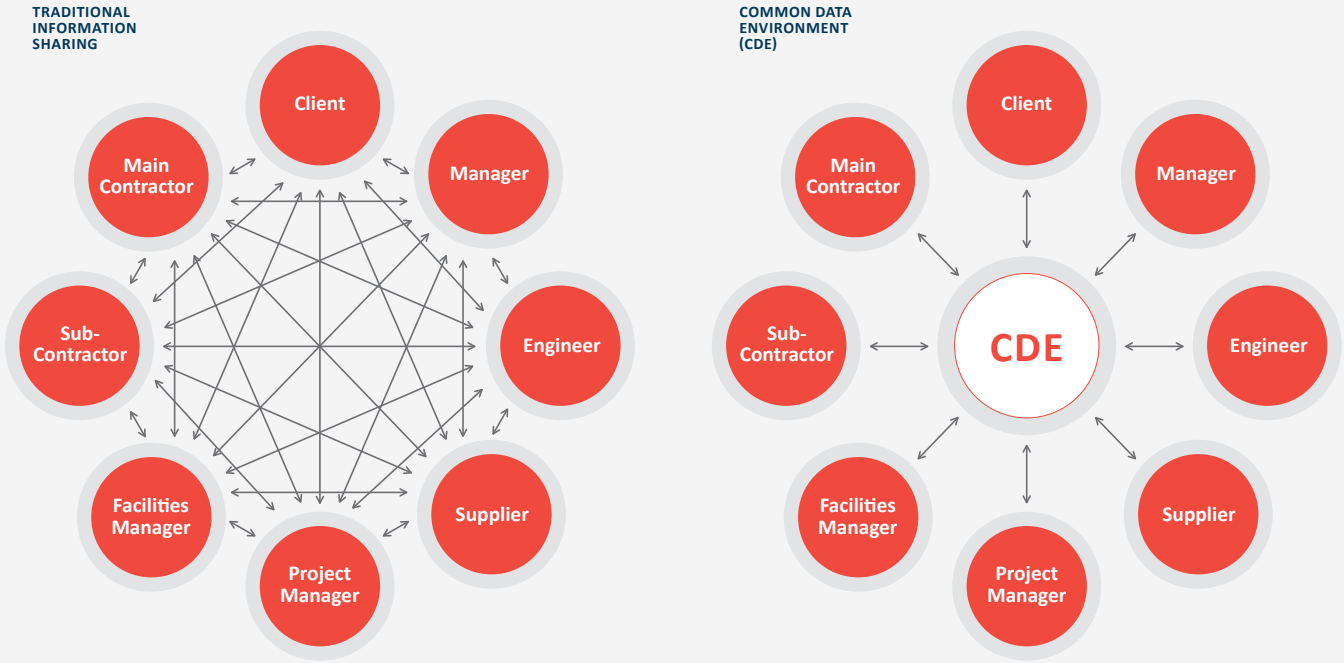
From a client's perspective, determining how much data is too much is a difficult job made even harder by virtue of ongoing updates once construction is complete and operation commences.

Once maintenance work begins, as-builts must be updated in the 3D model, asset management system, 2D geospatial plans, and potentially in the fixed asset register. Though not considered a huge job in the early stages of a project, this work snowballs as asset functionality impairs over time and major works are required to keep the asset fit for purpose.

Daniel Jurgens, project lead and technical director, digital engineering at WSP-Opus, said metadata standards can be hard to digest. "There is a long menu list of things you can grab – but it's hard to determine what exactly you need. So you've got to be pragmatic and apply the attributes that make sense – and ignore everything else."

Metadata standards support a standard means of aggregating information so that it fits into respective asset management systems. The greatest level of granularity sits within 3D models, which integrate with the asset management system and, in turn, the fixed asset register.

The challenge is in large part solved by a robust approach to defining information requirements. "Defining what your industry needs at an organisational level will steer the information required for assets," he said. "We jumped into the BIM execution plan before determining exactly what data we needed to capture."



Clear upfront thinking also has implications for setting up the BIM model. For example, if the maintenance plan is banking on understanding per-room wall and ceiling finishing costs, the model must be architected to slice and dice this data. Adjusting the BIM model retrospectively creates extra work. Equally, if the position of an element has been moved during design and construction, does it really matter, when, for example, there's plenty of room in the ceiling space to accommodate variances?

Stiffening upfront data selection criteria also cuts costs from data upkeep, as the volume of data will be smaller than data pooled from a more arbitrary selection.

A few other BIM planning oversights also raised the question about responsibilities for information capture. External surfaces, parking, and outside site works were initially omitted from the BIM execution plan. Though later rectified, the omission begged the questions: what happens when a contractor discovers in-ground services previously unknown? Who's responsible for capturing the information? And what needs to be geo-located, laser-scanned, or photographed?

Results and lessons

Jurgens said the project provided extremely useful lessons for the wider application of BIM to future NZDF building projects. "We know the pain-points, what worked well, and what to avoid."

He said the importance of planning and a solid upfront project brief cannot be overstated. "You've got to have your eyes wide open and a clear picture of return on investment." On this front, the metadata survey tool paid for itself many times over.

Defining business and asset requirements is critical to maintaining the most sensible number of attributes in the metadata table. Without this level of clarity the tendency is to say yes to everything, creating countless rows detailing hundreds of attributes, many of which have no relevance to your asset.

Project directors must pay special attention to naming conventions applied to files and documents in the BIM model. Jurgens said the industry grappled with the problem of people calling the same things by different names. Defining project nomenclature ensures anyone using the model can examine a drawing and know with certainty the origin of the document.

As New Zealand metadata standards continue developing, searching global standards will identify precedents and help avoid reinventing terms already accepted by the wider industry.

Data standards ensure the quick and easy extraction of common data from BIM models to agnostic platforms like Excel. But when it comes to agreeing data standards within the context of BIM projects, the hard work is at the front-end – before the BIM execution plan is written. Take a pragmatic approach to understand what your organisation is hoping to achieve – and what that means for the kind of information you should capture and maintain. Get it wrong and you create an unwieldy model, never mind necessitate data re-entry and errors that go with double handling. But done correctly, your model will ensure data can be shared effortlessly and, ultimately, populate an asset management system.

CONTACT:

Anthony Kerr, Asset manager, NZDF, email: Anthony.Kerr@nzdf.mil.nz

Daniel Jurgens, Technical director, digital engineering, WSP-Opus
email: Daniel.jurgens@wsp-opus.co.nz

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