Digitizing New Zealand’s Innovation Agency

Presenters
Hugh Evans, Design Lead | @callaghannz
Jason Howden, Digital Innovation Leader | @warrenandmahoney
Background to this presentation

Callaghan Innovation is New Zealand’s innovation agency, activating innovation and helping businesses grow faster for a better New Zealand.

Callaghan Innovation, with Architect and BIM specialist Warren and Mahoney, present on lessons learned from implementation of an ISO 19650 aligned process for redesign of their Gracefield Innovation Quarter (GIQ) site, from Appointing Party & Lead Appointed Party perspectives, and through utilization of the Autodesk BIM 360 ecosystem for working (and collaborating) in the cloud.

The GIQ is set on 10-hectares that is home to over 200 leading scientists, engineers and researchers. The GIQ site is currently undergoing significant investment, as part of a $130m redevelopment investment to achieve a vibrant, supportive and connected innovation community.
About the Speakers
Hugh Evans - Callaghan Innovation

Design Lead for Callaghan Innovation, New Zealand’s Innovation Agency, and responsible for a team involved with the $130m redevelopment of the Gracefield Innovation Quarter (GIQ) site.

Hugh has worked across the fields of consulting and mechanical engineering, and in other multidisciplinary roles, with a track record of delivering leadership across projects in Australia, New Zealand, Norway, Singapore, UK and USA.

In joining Callaghan Innovation Hugh sees a unique opportunity to bring the latest digital techniques to the redevelopment of a site that has a host of legacy issues, but a vision to support world-changing innovation through R&D.
Jason Howden - Warren and Mahoney

Associate Principal and Digital Innovation Leader for Warren and Mahoney, an Australian architecture practice with 300 staff across 7 studios throughout New Zealand and Australia. For 25 years Jason has been at the forefront of BIM, leading its development, promotion and education around the world.

Jason is a complex-project specialist who has consulted on some of the world’s largest public service facilities, including hospitals, laboratories, prisons and airports, with values ranging from $100 million to over $1.5 billion.

As W+M’s Digital Innovation Leader he works closely with our clients to develop bespoke technologies and processes to deliver the best possible outcomes for their projects.
Agenda and Learning Objectives
Agenda

Presentation will describe the BIM and Digital approaches adopted by New Zealand's Innovation Agency, as part of the transformation of the GIQ site

- GIQ and the projects
- BIM in New Zealand
- Procurement Methodologies
- Implementing ISO 19650
- Working in a High-Trust environment
- Unexpected Benefits
- Future Vision
Learning Objectives

• **Objective 1**
  o Discover procurement methodologies for the successful engagement of consultants and contractors in high-trust digital environments.

• **Objective 2**
  o Discover the benefits and challenges of implementing ISO 19650 on small to medium-scale projects.

• **Objective 3**
  o Discover the benefits and challenges of working in a high-trust “live” BIM 360 environment that’s hosted by the client/building owner.

• **Objective 4**
  o Learn about unexpected client and stakeholder successes from adopting a high-trust, cloud-based, collaborative environment.
GIQ and the Projects
GIQ Site
Aerial view 2018
The Innovation Quarter
R&D facilities across workshops, pilot plants, labs and specialised equipment.

Includes 252 Chemistry and Physics labs (10,500m²) and 292 office spaces (5,500m²).

Expertise in advanced materials, biotechnologies, IoT & data solutions, advanced manufacturing.

Victoria University of Wellington (Ferrier Research Institute & Robinson Research Institute).
GIQ Vision

“A vibrant, supportive and connected innovation community”, supporting Sir Paul Callaghan’s vision of New Zealand being “A place where talent wants to live”. 
“GIQ is set to get an upgrade with the Government investing in redeveloping the site”

Hon Dr Megan Woods, Research, Science and Innovation Minister.
Programme Tranches
GIQ Project Framework

DISCOVER

Pre-Project

Pre-appointment stage, leads to an understanding of the project parameters and build-up of the Project Initiation.

DEFINE

Indicative Business Case

GIQ team extracts elements from the 'Digital Twin' federated 3D Model and builds the Scope of Works for Procurement of the Project Team.

Pre-appointment BEP is reviewed with preferred Tenderer.

DESIGN

Detailed Business Case

Project Team is appointed, with a Lead Appointed Party nominated as the BIM Lead.

GIQ ensures client hosted BIM 360 is set up for the project and correct administrative rights are enabled for BIM Lead to coordinate the design process. BIM Lead finalizes the BEP, along with MPDT.

DELIVER

Practical Completion

Main Contractor appointed and on-boarded to BIM 360.

2D drawings, 3D Model and specifications are issued via the CDE, suitable for Construction.

3D Model used as basis for shop drawing/fabrication processes and MPDT applied for site verified capture to the Model.

GIQ integrates Model data back to the ‘Digital Twin’ and Asset Information to the Asset Information Model.
GIQ Site Digital Twin

‘Fly-thru’ of GIQ Site (BLD469202-GIQ-K-VI-001-Flythru_1080-RevA.mp4)

https://drive.autodesk.com/new/de2982716/shares/SH56a43QTfd62c1cd9682354508a4173665d

Password: “GIQ”
Digital Twin
BIM in New Zealand
BIM uptake in New Zealand

New Zealand BIM Handbook - Version 3.0

- BIM adoption is still strong in New Zealand. Formerly promoted via the BIM Acceleration Committee (BAC) throughout New Zealand.
- BIM adoption is predominantly led by design consultants but there is growing and strong support from tier 1 and 2 main contractors.
- Sub-trade contractors are starting to explore and embrace the benefits of BIM with many having been involved in the early BIM project through the Christchurch rebuild.
- With New Zealand being a small island nation lessons learned are quickly socialised across industry, with strong turnout at local and national BIM events supported by the BAC.

Among clients surveyed, 39% are integrating digital asset or spatial information with asset management systems, down from 47% in 2018.

Source: BAC BIM in New Zealand Survey 2019
Why do BIM?
Why do BIM?

- Design
- Construct
- Operate

OPEX vs. CAPEX
Encourage data to flow
Golden (BIM) Triangle

Total Cost of Ownership (TCO)

OPEX

CAPEX

OPERATE

DESIGN

CONSTRUCT
Procurement Methodologies
Procurement methodologies

Procurement plans and planning is in alignment with the GIQ Project Delivery Framework, this has been developed across several standard frameworks and staged gateways and include:

- New Zealand Government's Procurement Charter
- Managing Successful Programmes MSP™
- Prince2 project stages
- Programme Governance Approvals
- Treasury Better Business Case model
- ISO 19650
- ‘He rangi hou kei tua’ – the Callaghan Innovation Change Framework
- New Zealand Construction Industry Council Guidelines
Procurement methodologies

We articulated the unique opportunity to be part of one of the first projects undertaken on the GIQ Site and the opportunity for responders to showcase their skills and capability within the construction industry.

Callaghan Innovation is developing a Digital Twin of the GIQ site to serve as an exemplar (or catalyst for) the adoption of technologies that leverage the benefits of Industry 4.0, IoT, construction sector R&D, and integration of digital asset information to enhance predictive maintenance, site performance and operational efficiency capabilities of New Zealand’s infrastructure.
Procurement methodologies - ROI

For the first GIQ Project we undertook a two-stage procurement process, during which we shortlisted based on high-level capabilities.

Registration of Interest (ROI)

- The following was issued:
  - Project summary and very general project information requirements.
  - Define stage drawings and extracts from GIQ Digital Twin.

- We assessed on:
  - Project summaries - prior experience, project size and value.
  - Proposed personnel - capability & capacity to undertake the work.
  - 3D/ BIM experience, including alignment with ISO 19650 and an example BIM Execution Plan (BEP).
For the second stage we invited shortlisted consultancies to respond to a Request for Proposal, with response in the form of a presentation.

Request for Proposal (RFP)

- The following was issued:
  - Organisational Information Requirements (OIR) & Project Information Requirements (PIR).
  - Exchange Information Requirements (EIR) & File Naming Conventions.
  - Conceptual Drawings (Elevations and Sections), Geotechnical, Fire, Accessibility and other reports.
  - Schedule of Pricing.
  - Series of questions about:
    - Innovation, design philosophy & safety in design.
    - LOD 350 in 3D Model, BIM protocols and systems, with reference to ISO 19650.
    - Experience deploying Autodesk BIM 360 for purposes of design collaboration.
Procurement methodologies - RFP

For the second stage we invited shortlisted consultancies to respond to a Request for Proposal, with response in the form of a presentation.

Request for Proposal (RFP)

- **We assessed on:**
  - Presentation and responses to ‘plain language questions’.
  - Named personnel.
  - Pre-appointment BEP.
  - Value.

- **Summary**
  - The two-stage approach allowed for an open market interaction, and an ability to meet and discuss the project with the respondent team, providing the same Q&A and information to all parties and gaining a real understanding of who would be undertaking key roles - such as the Design Management & BIM Lead roles, Task Information Manager roles and Model Element Author (MEA); i.e. who is responsible for modeling each system and element in the Model?
Benefits of implementing ISO 19650
ISO 19650 within the wider context of an asset management system, such as the one described in ISO 55000 Asset Management Standard, and addresses the Delivery and Operation of built assets.
“Clarity of functions, responsibility, authority and the scope of any task”

ISO 19650-1 clause 7.2
Information management function

ISO 19650 adoption for GIQ

- Sets out the concepts and principles in support of the management & production of information during the lifecycle of built assets.
- Provides clarity of functions, responsibility, authority and the scope of any task to enable effective information management.
- Provides a framework to define the asset information requirements.
- Reduction of risk, and reduction of cost, through creation and use of asset/project information models by the most appropriate party, aligned to their role on the project.
- Enables a consistent approach, to be taken across as portfolio of programmes and projects.
An information management function is carried out by (or on behalf) of the appointing party, the lead appointed party and the appointed party.

<table>
<thead>
<tr>
<th>Parties</th>
<th>Teams</th>
<th>Interface between Parties and Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> Appointing Party</td>
<td>1 Project Team</td>
<td>Everyone involved in the project, regardless of appointment/contract arrangement.</td>
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<tr>
<td></td>
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<tr>
<td><strong>B</strong> Lead Appointed Party</td>
<td>2 Delivery Team</td>
<td>Lead appointed party and associated task teams (e.g. a contractor and their subcontractor and suppliers)</td>
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<tr>
<td></td>
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<tr>
<td><strong>C</strong> Appointed Party</td>
<td>3 Task Team</td>
<td>A person or group of people performing a specific task – e.g. the structural team, or mechanical subcontractor.</td>
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### Information management function (indicative)

<table>
<thead>
<tr>
<th>Aspect of information management function</th>
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<tr>
<td>Establishing project and LAP information requirements</td>
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<td>Compiling tender response (pre-appointment BEP etc.)</td>
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<td>Information acceptance</td>
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Information management function

Project setup - Master Information Delivery Plan (MIDP)
Information management function

Task Information Delivery Plan (TIDP)

Each task team manage is to compile their own TIDP which then assist in the development of the MIDP (to align with GIQ MIDP template).

Each task shall have a corresponding milestone that aligns to the overall design and delivery timeline.
## Information management function

### Project setup - Model Production Delivery Table (MPDT) - MEA & LOD

#### Callaghan Innovation - Gracefield Innovation Quarter
#### Model Production and Development Table (MPDT) - Architecture (A)

<table>
<thead>
<tr>
<th>Model Element</th>
<th>Concept Design</th>
<th>Preliminary Design</th>
<th>Developed Design</th>
<th>Detailed Design</th>
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## Project setup - Model Production Delivery Table (MPDT) - UniForm & Metadata

### Callaghan Innovation - Gracefield Innovation Quarter
Model Production and Development Table (MPDT) - Architecture (A)

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<td>Yes</td>
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<td>No</td>
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Information exchange - information requirements
Information exchange - information requirements
The Common Data Environment (CDE) uses solutions to support processes which ensure that information is managed and readily available for those who need it, when they need it.
Graphical, model data

BIM 360 is the CDE for Graphical Model Data
Documentation / non-graphical data

Google Drive is the CDE for documentation and non-graphical project information
GIS data

Esri ArcGIS (via AGOL) forms the basis of the cloud-based CDE for GIS data
Challenges of working to ISO 19650
Challenges of working to ISO 19650

When good information becomes too much information.

- Often aligning digital data is the biggest challenge for any project. With ISO 19650 we have a solution for this alignment challenge.
- Organizations have invested heavily in developing and refining their systems for optimum efficiency, deviating from these systems adds complexity and effort to the overall process.
- When embarking on early adopter ISO 19650 projects it can be easier to limit the amount of uptake and compliance with ISO 19650 to those that return the most value, while limiting the disruption on the supply chain.
- Education is key to successful transfer from legacy systems to ISO 19650.
Challenges of working to ISO 19650

Implementing ISO 19650 (and adopted File Naming) into Revit Workflows.
Working in a High-Trust (Cloud-based) environment
Having a clear plan is key

BIM EXECUTION PLAN

Callaghan Innovation Tranche 5.1

2.3 Intellectual Property and Model Exchange

With a Model(s) as a project deliverable there is far more interdependency between the documentation of the design disciplines during the design phases and sub-trades during the construction phase. To maximise the benefits of BIM this Information must be available for others to use during the development of design of the project on a known and understood basis.

The exchange of Models is the very basis of the BIM process. All users need to understand the level of reliability that they can place on the models they are receiving. Models can contain far more information than traditional electronic deliverables.

The issuer of a Model must clearly define what it can (and cannot) be used for, below is a list of approved Model Status for this project:

- Property and Model Exchange:
  - A project deliverable there is far more interdependency between the documentation of the bringing the design phases and sub-trades during the construction phase. To maximise the information must be available for others to use during the development of design of the and understood basis.
  - Models is the very basis of the BIM process. All users need to understand the level of all place on the models they are receiving. Models can contain far more information than deliverables.
  - Must clearly define what it can (and cannot) be used for; below is a list of approved the project;
  - For Information – Issued for information only;
  - In Progress – Issued for ongoing coordination;
  - Results of BIM this information must be available for others to use during the development of

Project Participants

The responsibility to follow the intent and procedures as detailed in this BEP to

Project Participants

For the LOD specified in the BEP using the level of skill required under its

Project Participants

To outside the Project Participant’s reasonable control (including acts or

Project Participants

to this BEP and nothing contained in the Project Participant’s Consultancy

Project Participants

not convey any ownership right in the Data or in

Project Participants

Document or remain vested in the Project Participant that provided that Data.
Enabling collaboration
Autodesk BIM 360

Working in a high-trust (live) BIM 360 environment

- Autodesk BIM 360 was identified early on as providing an ideal platform for the projects Common Data Environment (CDE).
- Key components included:
  - Managed ‘Open’ Collaboration of all consultants BIM data (not just Revit models).
  - The ability to have ‘Live’ (on Save to Central) model sharing.
  - Simplified administration of the CDE.
  - Transparent history of model sharing with the build-in ‘swimlanes’.
  - 2D and 3D Model viewing capabilities.
  - Compliant data security measures (Cloud Security Assessment)
  - Able to be Client Hosted but managed by the appointed Delivery Team.
Simplified administration
Structured collaboration
Open access to project data
Tracked formal information exchange
Greater visibility and insights
Unexpected Benefits
COVID-19

Image: CDC/Alissa Eckert
A global pandemic and Working from Home (WFH)

- As soon as the project started everyone in the project team was thrust into ‘Alert Level 4’ “Lockdown”.
- Our innovative digital strategy for this project quickly became our ‘new normal’ as we grappled with a new way of working.
- Autodesk BIM 360, with Google Meet (and other cloud-based technology), is just how we do projects now.
- Allows flexible working & WFH, with the ease of more regular collaboration, supplemented with in person site based meetings as government restrictions allow.
The Unexpected continued...

3D Model Coordination and VR

- BIM 360 opened up a new way of working in a remote environment.
- After returning to our primary places of work these tools were continued to be used by the team to increase engagement in the virtual environment.
- Virtual Reality and interactive 3D model coordination sessions are examples where the team are augmenting their day to day with what was previously considered ‘nice to have’ digital workflows.
- Resulting in higher engagement, better collaboration, higher-quality design deliverables.
Future Vision
“Rome wasn’t built in a day, but they were laying bricks every hour”

John Heywood
Future Vision

Digital Transformation is a Journey.

- The team is committed to progressing and building on the foundations laid to date areas of focus include:
  - Further use of BIM in the Operational and Facilities management processes, health, safety and hazard identification, and embodied carbon analysis;
  - Researching the use of 3D printing and the use of ‘smart’ devices in the active monitoring and enabling preventative maintenance of critical building services and site wide infrastructure;
  - Enabling the use of the 3D Model on campus via ‘game technology’ and mobile devices, providing operations & maintenance staff ‘superpowers’ to see through walls, explore the past and see into the future digitally.
- For GIQ our journey has just begun....
Better by Design

Enhanced seismic (non-structural elements) and passive fire modelling.
Project J01976 (Trance 2.3 HVAC) - 3D Render of Seismic Restraint in the Model
Safer Facilities

Capturing health and safety, operational risks and hazards in BIM.
Protecting the Environment

Using BIM to make better and more informed decisions.

[Image of a table comparing trees to hectares and diagrams showing embodied carbon analysis.]
Working with ‘Super Powers’

Using Augmented and Virtual Reality with BIM to ‘expose’ the ‘hidden’.
Constructing with ‘lego’ bricks

Using 3D printing to unlock new methods of construction using traditional materials.