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Government as Client: Challenges using Building Information Modelling on NZ Construction Projects

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Commissioned by the NZ BIM Acceleration Committee



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1 Executive Summary

This report revisits the Government projects that were reviewed and reported on last year. As with the last report, this review has been commissioned by the NZ BIM Acceleration Committee and funded by BRANZ to engage with Government agencies in their use of Building Information Modelling (BIM) on public sector construction projects and explore the potential future use of BIM by Government agencies.

During this review, the project team revisited the Ministry of Health (Acute Services Building, Christchurch and Greymouth Hospital, and the Ministry of Education. This was with a view to revisiting Government's role in accelerating the use of BIM across NZ construction projects and through the construction supply chain.

Findings/Challenges identified to date are summarised below:

- Capability of consultants
- Client capability
- Changing sector culture & behaviours
- Who pays?
- No environment for knowledge sharing – successes and failures
- Consenting system challenges – BIM readiness?

2 Introduction

Background

The Building Information Modelling (BIM) Acceleration Committee¹ continues to explore the adoption of BIM across the delivery of construction projects in New Zealand.

Previous activity and the Government's role

The BIM Acceleration Committee identified that Government, as a client of construction activity, has a key role to play in the adoption of BIM across projects and as part of their procurement activities. In other countries, such as the UK, the use of BIM has been mandated on construction projects funded by the UK Government. The approach to date in New Zealand has not been to intervene through mandated use but to monitor projects that have used BIM in their delivery.

Last year, the Acceleration Committee, via a BRANZ commissioned report, explored the role of Government agencies in the adoption of BIM across construction projects. This activity included interviews with three agencies and culminated in a Government client workshop. The agencies attending the workshop identified that the key barriers to implementing BIM are:

How to apply to smaller projects and on-going maintenance

Entrenched behaviours

Cost / budget

Maturity of consultant chain

Understanding client requirements

Cost and benefit

Change management

Lack of awareness of BIM over whole of life

Data standards

Knowledge handover

Capability in the market

The Acceleration Committee continues its interest in the role of Government agencies in the use of BIM across construction delivery and, via BRANZ, has commissioned additional research to follow up on the findings of the original report² to review the challenges being experienced by Government agencies in their adoption of BIM

2.1 Methodology

The methodology for this update report is based around two review meetings with the Government agencies from the original report – Ministry of Health and Ministry of Education.

The report summarises the outcomes of the above activity and tracks developments since the original report from June 2015.

¹ <http://www.buildingvalue.co.nz/BIM-in-NZ>

² Government as Client: Using Building Information Modelling on NZ construction projects

3 Government Agency Reviews & Updates

From the original project, the project team interviewed three Government agencies that were already using BIM or thinking about using BIM on their construction projects or broader programmes of work. From the agencies that were originally interviewed, different approaches were being adopted in agency use of BIM. This was dependent on client capability and the quality of advice being provided by the construction market and construction professionals.

There were two broad approaches in the use of BIM by Government agencies:

- **Use on the delivery of major construction projects.** Use of BIM on significant value construction projects. This is primarily focused on capital works delivery, co-ordination of the project delivery and project team, 3D modeling, project clash detection and stakeholder engagement.
- **Strategic programme use.** A more strategic approach, using BIM across a broader programme of work being driven by a strategic whole of life asset management approach to managing the asset portfolio as well as aiding construction delivery. This recognizes the need for the use of BIM in asset management planning.

The two agencies revisited are:

- Ministry of Health – BIM use on the Acute Services Building & Greymouth hospitals
- Ministry of Education – BIM used strategically across the national programme

3.1 Ministry of Health

3.1.1 Review of approach

The Ministry of Health is using BIM on the Acute Services Building (ASB) in Christchurch and on the Greymouth Hospital new build. The Ministry specified the use of BIM prior to both projects commencing due to the complex nature of services in health facilities.

The benefit the Ministry was seeking from using BIM on both projects was:

- a faster more efficient build with less clashes and issues on site
- better outcomes with associated cost savings
- assistance with stakeholder engagement and consultation
- maintenance and FM manuals to pass to asset management team post project completion

The response from the market had been good with 4 of 5 contractors expecting the Ministry to specify the use of BIM on both projects. Experience, at the time, suggested that the market was on a steep learning curve understanding BIM with organisations across the supply chain struggling to collaborate and to share best practice. Market experience from the Ministry was that whilst consultants and contractors projected their knowledge and understanding of BIM, this tended to be from a technology driven perspective rather than the practical benefits, delivery efficiencies, associated benefits and cost savings to the client.

Overall, the Ministry had decided that BIM was required for hospitals. Typically District Health Boards (DHBs) are not well positioned, in terms of skills and capability, to deliver large scale projects. This requires a step change in how clinical services are delivered with

different facilities being built for different requirements and sizes of hospitals but they do require similar standardized designs and specifications.

The benefits of using BIM to date on ASB and Greymouth have been:

- Stakeholder engagement benefits with the clinical services teams
- NZ BIM acceleration documents have been critical in the design and tender process
- International interest in the contracts is being driven by BIM being specified in the contract along with the scale of both projects
- Ministry focused on next steps and asset management post project delivery
- Contractor professionalism has been improved by specifying the use of BIM on the projects

The lessons learned so far from both projects is as follows:

- Designers and contractors are still understanding BIM and its potential impact on construction delivery – the supply market is on a steep learning curve
- As a result, BIM maturity with consultants and contractors is still very low and is typically technology solutions driven rather than sharing data to improve construction delivery
- Using BIM to address a step change in medical requirements of health facilities – with health community stakeholders
- High fees and poor design management capability hindering progress
- Also issues around prescribed vendors and interoperability issues

In summary, it is still early days for the Ministry of Health with both projects in the tender stage. There are issues around sector capability but the industry is learning quickly. Further collaboration across the supply chain is required and issues around vendor models and interoperability of different systems is still a challenge. Strategically the opportunity of using BIM on health projects should meet future health sector asset requirements and asset management needs.

3.1.2 Update on progress

Almost a year after the original discussion, the Ministry has been making good progress on their project delivery and the use of BIM on ASB and Greymouth. There have been a number of challenges experienced and associated learning as the projects have progressed.

ASB Update

The approach adopted by the Ministry was to specify the use of BIM in the consultant's contract with Level of Detail (LOD) 250 minimum required with co-ordination through the trades and supply chain specified. The concept of 'Level of Detail' was developed as a measure of how definitive an element is in terms of costing it. For example, LOD 100 meant not very definitive, an area or volume rate is accurate enough, LOD 200 you can assume the number of items in the model is correct, but then use an estimate for each, LOD 300 items are identified and actual cost can be used, LOD 400 is a measure of what has actually been supplied so can be used to assess payments. It also tells you how decisive each building element is and how complete its representation is on a drawing in the case of the Ministry, the element of the walls being 50% complete would lead to LOD 250 being achieved whereas if the service ducts are only 40% complete it would result in an LOD 200.

The consultant team selected for ASB was Beca (building services), Warren & Mahoney (architects), Aurecon (fire) and Holme (steel).

The project is currently in the pre-construction phase with the BIM model currently being assessed by the project team. The consultant team has developed the 3D model and as well as modeling the ASB facility, the entire hospital campus has also been 3D modeled. This should have practical benefits at a later date for the Ministry and the local District Health Board with the integration of the ASB facility with other parts of the hospital campus. The foundation model is now in place for a future 'as built' asset management model for the hospital campus.

Construction on the ASB project is due to start during April 16 and the intention is that the risk associated with design co-ordination will be passed to the contractor.

The client experience on this project to date is that there has been a constant challenge with the consultant community in terms of developing their capability and experience in the use of BIM on construction projects. This has impacted the quality of the advice provided by the consultant team and also impacted project outcomes.

In the view of the Ministry, the consultant community needs to significantly improve their capability in providing appropriate advice to clients on the use of BIM on construction projects. They also need to specify what software is required for interoperability purposes and also acknowledge the challenges of the supply chain engaging in the use of the model as project delivery progresses.

Greymouth update

BIM is also being used on Greymouth with CCM Architects (architects) and Opus (engineering) forming the consultant team. The project is currently going to detailed design phase. Contractors bidding into the project are currently over budget which has created a 3-4 month delay on the project and has resulted in the project shifting towards a fixed price lump sum approach.

Overview of BIM use to date

The Ministry view on the use of BIM to date on the ASB and Greymouth projects is that it currently adds no real benefit to the client. Key challenges for the Ministry include the following:

- BIM being used for the project delivery only rather than for full asset management purposes

- Clash detection is still a prominent feature for BIM use on construction projects. Significant clashes still being found on ASB
- Capability of consultant teams. Challenges still exist around the consultant team knowledge and understanding of BIM and its use.
- There is a view within the Ministry that the consultant community “cannot walk the talk” in terms of converting advice into delivery
- Consultant advice still focused on BIM for construction delivery rather than through life benefits and asset management capabilities (this has been the Ministry’s experience on the Greymouth project)
- Client capability to explore long term facilities management led approach. A shift in thinking is required on how Government agencies manage public sector assets and Treasury should be fully engaged in this process

The use of BIM needs a smarter approach from Government agencies and Treasury. There are still issues around who pays for BIM (usually the client) and a tender premium associated with using BIM on construction projects. Government agencies should be ring fencing a proportion of the capital expenditure budget to allocate for using BIM on projects.

Or should Government mandate the use of BIM and set minimum requirements linking the use of BIM to asset management plans? Could BIM become part of the Building Act or part of the Treasury’s Better Business Case process? From the Ministry’s experience of using BIM on two construction projects, a step change is required to actively enable the use of BIM on projects and to positively influence building sector culture and behaviours in the take up of BIM and data exchange principles between supply chain partners.

The Ministry has additional challenges around the use of standardised design in hospitals. There are no benefits associated with bespoke design. Design needs to be standardised and repeatable for future delivery efficiencies, future proofing and efficient maintenance of hospital buildings. BIM could play a significant role in enabling the efficient use of standardised designs across the Ministry’s portfolio as well as across asset portfolios of other Government agencies.

The Ministry advised that education is still urgently required for construction clients and to all parts of the construction supply chain around what the achievable benefits of BIM are and what project environment needs to be created to enable successful use of BIM. This includes the construction contracting models and procurement methodology used by agencies. Workshops, presentations, website, resources and a compelling business case for the use of BIM are required for the sector to accept BIM business as usual offer to all construction clients.

When asked about the future use of BIM by the Ministry the following common questions arose:

- Who pays?
- What’s the benefit? (too much 3D modeling which isn’t BIM)
- How do we get the market engaged and educate them to the benefits of BIM use?
- What role does Treasury have in driving a more asset management driven approach

In summary, the Ministry’s use of BIM on the ASB and Greymouth projects has not delivered either the expectations or the proposed benefits that the Ministry was looking for. This is

partly a lack of maturity of taking a more whole of life/asset management approach to asset delivery and management. There is also concern from the Ministry around market maturity and awareness plus ability to deliver on a project where BIM is specified. More education and market engagement is required.

3.2 Ministry of Education

3.2.1 Review of approach

The Ministry of Education is using BIM consultancy services to validate the benefits of use of using BIM across the national schools programme (smaller \$ value, larger volume, more repeatable projects).

The Ministry appointed Aecom as their strategic advisor is to:

- Obtain initial advice and guidance together with an understanding of requirements
- Specify what the Ministry wants to achieve using BIM – long-term benefits, implications of use, etc.
- Develop standard definitions and conditions
- Identify projects that can support the use of BIM – both large scale and more business as usual
- Implementation – what would be required to integrate BIM into the Ministry's requirements e.g. procurement, contracts, resources, people & capability, integration in FM and asset management

This is a more planned and strategic approach to the use of BIM across a programme of work with the Ministry seeking to work backwards through the construction process, starting with asset management and then back into construction delivery and design with the key challenge of creating better whole of life outcomes for the Ministry and more effective learning environments.

3.2.2 Update on Progress

Following the appointment of Aecom, the Ministry has progressed through the business case for the use of BIM on construction projects and is now engaging internal stakeholders on the establishment of exemplar projects which will showcase the use of BIM in construction delivery with an asset management approach through the life of the asset. As part of this process, Aecom is providing the Ministry with advice on future requirements and structure required for the use of BIM.

An exemplar project has been identified and established in Christchurch. The project is Spreydon School. A key aspect of the selection of this school was the Ministry's capital delivery team in Christchurch who are interested in using BIM across their portfolio of projects. A project management and integrated BIM management services approach is being used with assistance of an internal Ministry team to track project progress and capture lessons learned. The project team is using the Helio information management system to share data through the construction supply chain on this project.

Aecom is providing BIM related strategic advice to the project team and BIM manager on the project. As a result, Aecom cannot bid for project specific consultancy services to the exemplar project to avoid conflicts of interest. PM and design services have already been tendered and contracted for the project.

The Ministry is also exploring the use of the UK developed soft landings concept for project handover. The term 'soft landings' refers to a strategy adopted by the project team to ensure the transition from construction to occupation is 'bump-free' and that operational performance is optimised.

Throughout the project to date, the focus of the Ministry's project delivery team has been on project outcomes not the delivery process and ensuring that the school's requirements are met. The project is currently in the market for professional consultancy and design services.

The Ministry's approach to asset management is currently where opportunities are created school by school. Overall, there is a good opportunity to consolidate old stock via the property maintenance schools grants received.

The Ministry is building the capability for the Facilities Management provider to price asset management contracts off the BIM model. As part of this process, the Ministry is determining what information, alongside condition assessment and asset lists, the facilities management suppliers are required to price from the BIM model.

From a construction sector perspective, there has been interest in the Ministry's approach from IPENZ, from a sector engagement view, sustainability and international experience perspective and the holistic approach to managing assets.

Overview of BIM use to date

To enable the best possible environment for an asset management-led approach to succeed, a longer term approach to sector relationships, collaboration, and performance measurement needs to be in place. This impacts on culture and behaviours between the Ministry and the sector and associated contracting models and procurement methods used.

The Ministry has had good engagement from Aecom on the asset management-led approach and is now looking at adopting this approach across the Auckland Programme Business Case. The lessons learned to date will provide more effective organisation around the Auckland Programme using Early Contractor Involvement and panel arrangements with alignment of prequalification, Key Performance Indicators (KPIs), and better organised schedules of work.

BIM advice from Aecom to date has been practical and understanding of the Ministry's requirements around the use of BIM from an asset management perspective. When the Ministry went to market for the consultancy services being provided by Aecom, the majority of other tenders teams misunderstood the asset management related requirements to focus in a technology-led engagement with the Ministry. The Ministry associates this lack of sector understanding and alignment with:

- A lack of understanding of the full through life asset management approach required by the Ministry
- Misunderstanding that the specification of BIM in the tender documentation required a technology-led approach from the Ministry. This highlights the lack of understanding and sector capability around the use of BIM

The Ministry approach is to syndicate their asset management approach so that other agencies can benefit from the arrangements. Overall, the Ministry's view is that other agencies could be doing more to align with each other in terms of creating a consistent use of BIM with the supply market and also sharing benefits and lessons learned.

The Ministry suggested that a BIM client forum as the most appropriate way of sharing lessons learned and achieving greater consistency of agency engagement with the sector around the use of BIM in construction delivery and managing assets through life. The Ministry also advised the need for this Forum to be client led rather than contractor or designer led to get the associated common understanding and improvement actions for future BIM use on Government projects.

As well as a client BIM forum, the Ministry suggested that other resources such as case studies, contacts, documentation and access to other relevant information need to be made available to agencies and the sector to improve the understanding around the use of BIM and improve the consistency of BIM application on projects and programmes of work. Information should be focused on processes and outcomes not models or technical guidance.

From the Ministry's perspective, Building Information Modelling is about obtaining and sharing better data and information to drive improved decision making in project teams. This should also assist in improving the capability of the asset manager and the role of BIM in improving the management of assets.

4 Challenges for NZ Government Clients using BIM

The challenges identified from the interaction with the two Government agencies are detailed below:

4.1 Challenges of using BIM on Government projects

Capability of consultants

- Clash detection is still a prominent feature for BIM use on construction projects
- Challenges still exist around the consultant team knowledge and understanding of BIM and its use and then applying it to projects
- Consultant community "cannot walk the talk"
- BIM only being used for the project delivery only rather than for full asset management purposes
- Focus on clash detection which detracts from other more significant benefits

Client capability

- In understanding how BIM can be used in construction delivery – don't just take consultant advice and then expect to get associated outcomes
- Use appropriate contracting models for use of BIM – projects using Design & Build or Early Contractor Involvement are more likely to be successful in using BIM
- The procurement methodology used also needs to match the collaborative environment to share information and create a platform for BIM to deliver
- Agencies should align with each other in terms of creating a consistent use of BIM with the supply market and also sharing benefits and lessons learned
- BIM gives clients a better understanding and surety around asset procurement and enables better decision making

Changing sector culture and behaviours – winning hearts and minds

- Help people to understand the benefits of BIM
- Focus on process NOT technology and what environment is required
- Need to look beyond how much BIM costs – see the benefits and the return on investment for working in a different BIM enabled environment
- Think transparency and collaboration – new and efficient ways of working using technology

- Sector needs to work on toolsets for delivery – explore other countries and utilize their approaches and resources in the implementation of BIM

Who pays?

- Still seen as a cost rather than investment
- Typically built into tender costs - the supply chain typically wants the client to cover this cost, not understanding the full benefits of using BIM
- Concept of the BIM premium – as BIM take up is still early in New Zealand, the use of BIM still commands a cost premium

No environment for knowledge sharing – success and failures

- Establishment of a BIM client forum to share lessons learned that should be client led rather than contractor or designer led to get the understanding and associated improvement actions for future projects.
- Education, training & communications to tailor for specific parts of the supply chain e.g. builders, designers, manufacturers, etc.
- Creation of other resources such as case studies, contacts, documentation and access to other relevant information needs to be made available
- Information needs to be focused on processes and outcomes not models or technical guidance. Focus on getting better information and improved decision making

Consenting system challenges

- Need to develop consenting authority BIM readiness so that resource consents can be processed using BIM models

4.2 Next Steps

- Government client workshop – 26th April 2016