Submission

Inquiry into Procurement Practices for Government-Funded Infrastructure.

Prepared for: The House of Representatives Standing Committee on Infrastructure, Transport and Cities.

Created by:

ABAB
AUSTRALASIAN BIM ADVISORY BOARD

Submitted: 16 July 2021

1. Background

This submission is in response to an inquiry by The House of Representatives Standing Committee on Infrastructure, Transport and Cities, into **procurement practices for government-funded infrastructure**. The submission is made on behalf of Australasian Building Information Modelling (BIM) Advisory Board (ABAB) and is consistent with the board's vision and purpose but does not necessarily represent the views of independent Board members.

Terms of Reference for the Inquiry are:

a. Existing infrastructure pipelines and related supply requirements.
b. Challenges and opportunities with existing procurement practices, including frameworks, standards, rules and norms, and intersections between tiers of government and the private sector.
c. Challenges and opportunities to enhance Australia's sovereign industry capability, including for Australian owned businesses.
d. Lessons from other Australian jurisdictions and other portfolio areas, including Defence's industry capability approaches.
e. How Australia can balance its international obligations with maximising local content opportunities, including by leveraging foreign direct investment.
f. Alternative procurement models, including reference to international examples.
g. Other relevant matters.

2. ABAB Introduction

Established in May 2017, the ABAB is a first for the Australasian building sector in partnering government, industry, and academia. This voluntary board provides direction to improve productivity and project outcomes by taking a leadership and coordinating role in the consistent adoption of BIM and digital delivery with its associated integration and collaborative processes. To further understand ABAB and our achievements refer to Appendix 1 for more information.

Together, ABAB provide public procurement advice through guidance papers, connecting projects, and delivering industry initiatives. This influence is governed by the groups vision to improve productivity and asset outcomes, which relies on a sound procurement phase. Hence, the impacts on procurement practices for government-funded infrastructure is a priority for this Board.

This submission replies to the inquiry looking at the terms of reference through a productivity lens. This lens is to provide insight to the whole-of-life aspects of government-funded infrastructure, indicating areas of improvement based on BIM and digital delivery. This improvement is to deliver and manage our public assets more efficiently and effectively through collaborative digital workflows. Providing an avenue to improve productivity, improve government spend, and deliver better public outcomes.

For further information on this submission, please contact ABAB's founding partners:

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2.1. ABAB Representatives

Australasian Procurement and Construction Council Inc.	Australian Construction Industry Forum
NATSPEC	buildingSMART Australasia
Standards Australia	Austroads
Brisbane City Council	Department of Infrastructure, Planning and Logistics, Northern Territory
Department of Treasury and Finance, Victoria	Department of Defence
Department of Finance, Western Australia	Infrastructure Australia
Department of Infrastructure, Transport, Cities and Regional Development, Commonwealth	Infrastructure NSW
Major Projects Canberra	Department of Infrastructure and Planning, South Australia
Transport for NSW	Department of Infrastructure and Planning, South Australia
CSIRO, Data 61	Department of Transport and Main Roads, Queensland
Society of Construction Law	Property Council
Australian Institute of Quantity Surveyors	

2.2. Overview of ABAB Recommendations

For the reasons outlined in this submission, the ABAB recommends that Government adopt the following points and include them in the procurement practices strategy:

Procurement model development

- ABAB recommends the use of BIM and digital delivery on all major government infrastructure projects in line with The Productivity Commission Report into Public Infrastructure 2014 recommendation.
- ABAB recommends a suite of collaborative procurement models to be established that include digital delivery protocols, standards, and advice on live digital delivery management plans based on project size and complexity. The suite should be made to suit government department and agency procurement types such as panels, open tenders etc.
- ABAB recommends the development of consistent national BIM and digital delivery standards which align with the relevant international standards to provide certainty to industry.
- ABAB recommend a review of the Defence collaborative procurement models combined with international models to establish the appropriate suite of contracts.

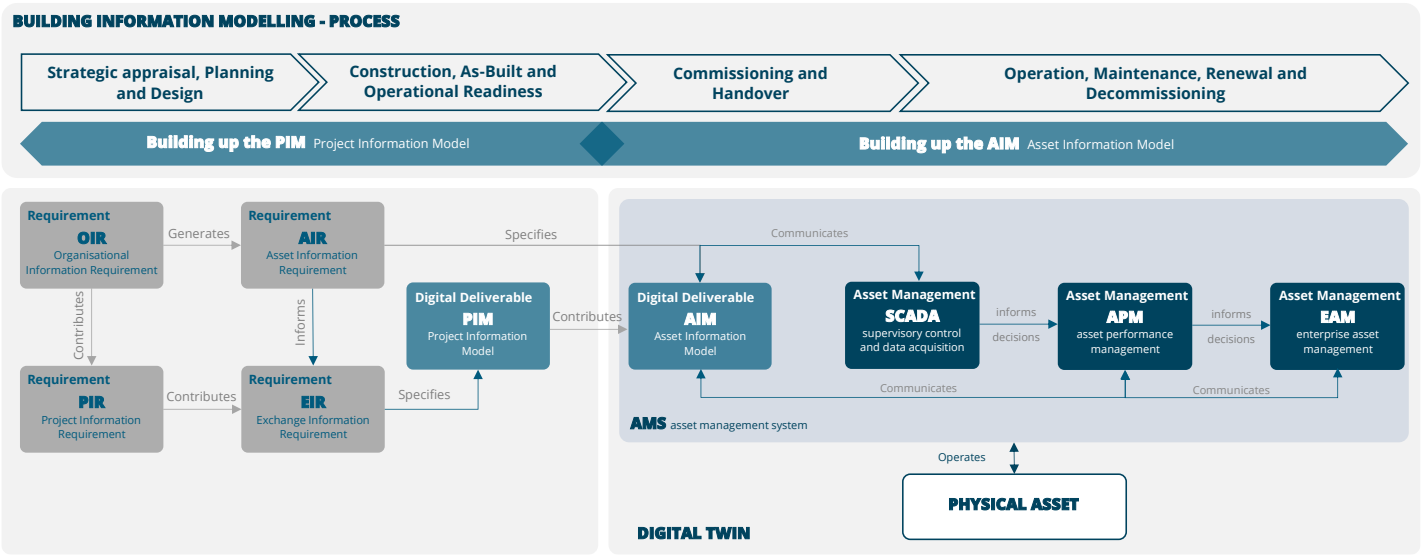
BIM and digital delivery initiatives

- Acknowledge the significant benefits which will accrue from the widespread adoption of Building Information Modelling (BIM) and digital delivery in the Architecture, Engineering and Construction (AEC) and asset management sectors.
- Acknowledge the continual improvements in BIM and digital delivery technology being developed by industry nationally and internationally.
- Support the work of the ABAB and other peak groups seeking to facilitate the adoption of BIM and digital delivery in Australia.
- Inclusion of the ABAB in discussions with government on the direction of digital transformation in the AEC and asset management sectors.
- In conjunction with the states and territories provide funding to support the widespread adoption of BIM, including funding for an entity bringing together industry, government and academia to further research, education, and training in BIM and digital delivery (in a similar way to the Industry Growth Centre for Mining Equipment, Technology and Services METS).

The following paper provides the background and justification to the above recommendations.

3. What is BIM and digital delivery?

BIM is a digital process for creating and managing all of the information on a project – before, during and after construction. Digital delivery is the outputs of the BIM process, which is the Project Information Model (PIM) at the end of the construction phase, and the Asset Information Model (AIM) that the asset operator combines the PIM with the operational readiness or soft landings data to operate and maintain the asset. If the operator wishes to connect this AIM to the devices and asset management systems and run that asset virtually, this is referred to as a Digital Twin.



Source: Magnae: Digital Strategy, Process Optimisation, Digital Engineering, 2021

The digital delivery of a PIM or an AIM is a digital representation of the physical and functional characteristics of a building, physical infrastructure, or environment. It serves as a shared knowledge resource for information about an asset throughout its lifecycle supporting decision-making at each phase — from strategic appraisal and planning; through the design, construction and operation; and into maintenance, renewal and decommissioning.

When using a BIM process, greater effort is expended in the upfront stages to better prepare the project for success. This investment requires stakeholder involvement from all aspects of the projects lifecycle to be involved in the beginning or earlier phases. A good example is when the operators are involved in producing the Exchange and Asset Information Requirements (EIR or AIR), which is like producing a functional brief but it includes the data and information that is required to better manage the asset through all phases including after the capital build. Construction is also involved earlier in the design phase to refine the design in an effort to reduce the risks with the construction, commissioning, and handover of the asset. As the project travels through each of the phases the project information is buiding up in the 3D model which includes data and information. In essence the asset is built twice; once in a virtual sense, and then physically. This reduces and mitigates many of the risk factors asscoiated with construction along the way and creating more efficient and effective outcomes.

Other terms for the BIM process are recognised by the sub-industries within the construction industry. Digital Engineering (DE) is a term commonly used with the engineering process of civil infrastructure projects, however many refer to it as an extension to the BIM process where hgiher levels of simulations, calculations, and smart assessments are made with the PIM. Virtual Design and Construction (VDC) is another term which is using the PIM to virtually reherse, plan, and design the construction process. For the purposes of reaching the broadest audience possible, the term BIM and digital delivery is used throughout this submission.

We have also provided further information on BIM and digital delivery should you wish to understand the drivers behind our submission in greater detail. This information is found in *Appendix 2 - BIM and digital delivery as an agent of change in the construction industry*.

4. ABAB's priority in productivity

ABAB believes procurement of BIM and digital delivery, is a priority for government to help uplift Australia's productivity in the construction industry. With the construction industry's productivity in a gradual decline since 2013[1] the need for government to improve the productivity performance is paramount. The most efficient approach to achieving this improvement is at the procurement phase, through collaborative contracting such as Alliance, Integrated Project Delivery (IPD), or Early Contractor Involvement (ECI) that promotes the process of BIM and contractually developing Project Information Models (PIM). Those models are progressed into Asset Information Models (AIM) which are used to run and maintain the asset after the capital build. This process creates greater efficiencies across the entire lifecycle of government infrastructure with savings estimated to be worth $3.1 billion a year minimum.

Productivity

The Australian construction industry impacts productivity significantly as it is the largest non-services industry of the Australian economy, accounting for around 9% of GDP. This industry employs 1.18 million Australians with a further 100,000 jobs being forecasted over the next three years to 2024[2]. The productivity decline of the industry indicates a drop of 21.32 in the labour productivity index (LPI) since 2013. This number taking the industry below the low levels of 2010. This is a significant drop when you consider the value of the activity from this industry alone is $205 billion. The reason infrastructure procurement requires a higher emphasis on productivity is engineering and construction are the dominant sub-industries and the main participants in government-funded infrastructure projects.

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a year minimum.

Procurement

The sub-industries of engineering and construction are commonly using a variety of different procurement models depending on the economic situation. Many of those procurement models reduce the productivity of projects due to the lack of shared responsibility across the lifecycle of the project. This amounts to significant waste between project phases as stakeholders only perform to the phase they are contracted. To reduce this waste, collaborative contracts are required particularly those that involve the stakeholders to work collaboratively from the beginning rather than 'daisy-chain' their way through the project lifecycle. This is primarily the Alliance/IPD models. The reason for this is to enhance the development of information across the phases of the project, which inevitably enhance productivity as all disciplines are aware of the impacts their decisions make. The collaborative contract is the first step, it needs to be enhanced by establishing contractual digital deliverables along with the physical build to make the productivity impacts.

Digital Delivery Requirements

The procurement model must include the digital delivery of Project Information Models (PIM) to guide the collaborative nature of the procurement model. The stakeholders need to follow Digital Engineering processes which are documented frameworks in BIM. The international standards ISO 19650 provide guidance in how this is achieved across three parts: Concepts and principles; Delivery phase of the assets; and Operational phase of the assets. This framework establishes collaborative workflows that develop a digital replica of the physical asset which is the PIM. The PIM is handed over with additional information from the operational readiness phase which the asset operators and owners convert into their AIM.

[1] Statista 2021, Labor productivity index (LPI) of the construction industry in Australia from financial year 2010 to 2020, Statista, Viewed 5 July 2021, < https://www.statista.com/statistics/1078127/australia-construction-labor-productivity-index/>

[2] Ganwal, L 2021, Number of employees in the construction industry in Australia from 2010 to 2020 with a projection for 2024, Statista, Viewed 5 July 2021, < https://www.statista.com/statistics/1112231/australia-employment-in-construction-industry/>

Digital Maintenance

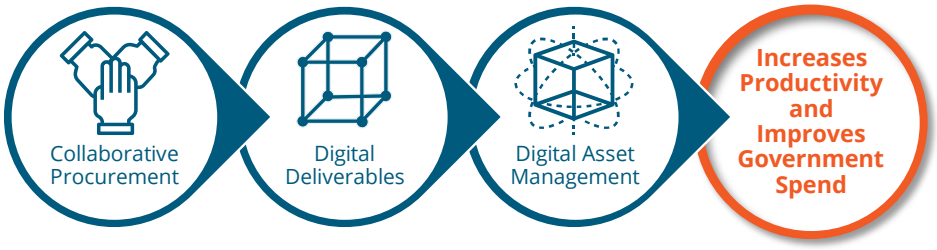
The AIM becomes part of the digital eco-system of the asset and can be developed into a Digital Twin. The Digital Twin is the AIM connected to the physical asset and other asset management systems. This creates efficiencies as all asset operation and maintenance decisions are made with a greater understanding on their impacts. This results in understanding what design changes would assist in operating the asset more efficiently. Which in return creates more robust requirements for future infrastructure procurement. Effectively becoming a key enabler for Smart Cities.

Savings

When combining those robust requirements with the efficiencies digital delivery brings, the country can produce significant savings. The estimated construction activity in Australia is $205 billion in 2020 and a typical waste of effort, due to non-collaborative processes, is reported at 30%. ABAB focus on promoting digital delivery as a conservative 5% productivity improvement (in the 30% waste) driven by BIM would result in a $3.1 billion savings each year.

The productivity commissions inquiry report into public infrastructure in 2014 recognises the savings and other additional efficiencies. The report indicating four specific recommendations into the efficient use of BIM and digital delivery to improve decision making, improve consistency of project analysis, and to provide a common medium to enable better comparison between project performance.

Overall, ABAB promote the combination of the collaborative procurement model with the digital delivery contractual requirements of the PIM. The efficiencies realised will be in the productivity across the plan, design, construct, operate, maintain, and renew/demolish phases of an asset's lifecycle. This is vital to help Australia's construction industry remain competitive and improve the use of infrastructure funding.



ABAB recommends the use of BIM and digital delivery on all major government infrastructure projects in line with the Productivity Commission recommendation.

5. Why BIM and digital delivery?

Digital delivery is the glue that will pull all government digital initiatives together. In the previous section we have discussed how digital delivery needs to be embedded into the contractual requirements of the collaborative procurement model to improve productivity of the construction industry, primarily through projects. This section we cover how the productivity improvement is reached when the digital delivery outputs, such as PIMs and AIMs, are used in Digital Twins for State planning, to differentiate Australia's digital skills, and to drive Australia's digital economy.

Existing infrastructure pipelines and related supply requirements.

Many of the large infrastructure projects in Australia over the past four to six years have been significantly large projects that Australian companies have needed overseas support to deliver. However, within Australia's construction 71% of the workforce are employed by Small to Medium Enterprise (SME) that are often excluded from such significant projects[3]. This exclusion starting from a lack of ability to invest in the tendering process through to the risk ownership or burden that SMEs simply cannot afford.

To bridge this gap, ABAB suggests considering how the digital delivery of all current infrastructure projects could assist in inviting SMEs into these projects and making procurement easier for SMEs in the future. Some possible opportunities include:

- Utilise digital delivery of PIM and AIM models into State-wide Digital Twins to better inform impacts and decisions on future pipeline of projects.
- Utilise the State-wide Digital Twins to visualise the breakdown of work packages and how SMEs may be able to participate in smaller sections of the larger projects.
- Ensure SMEs are included in the large consortiums for the large/mega projects, suggesting that BIM and digital delivery may be the avenue to build competency into the industry.

Challenges and opportunities with existing procurement practices, including frameworks, standards, rules and norms, and intersections between tiers of government and the private sector.

In our previous section we have suggested using digital delivery and the integration of the digital delivery into State-wide Digital Twins to better inform decision making. To ensure this is useful, National digital delivery standards need to be established. Those standards are to guide both government-procurement and the suppliers in areas of roles, responsibilities, and deliverables.

ABAB recommends a suite of collaborative procurement models to be established that include digital delivery protocols, standards, and advice on live digital delivery management plans based on project size and complexity. The suite should be made to suit government department and agency procurement types such as panels, open tenders etc.

Challenges and opportunities to enhance Australia's sovereign industry capability, including for Australian owned businesses.

Australia needs to endorse and standardise digital delivery for all infrastructure procurement in an effort to enhance Australia's capability within the global construction industry. The Australian Government are investing in a digital economy strategy, Infrastructure Australia are looking for a 'digital by default' approach, and each State Government are producing Digital Twin initiatives to enhance decision making. All of these strategies and initiatives point to building Australia's competency and capacity in digital delivery for the construction industry.

[3] Parliament of Australia 2018, Small Business Sector Contribution to the Australian Economy, Parliament of Australia, viewed 11 July 2021, <https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1819/SmallBusinessSector>

The issue is, Australia is behind many countries who have already developed the collaborative procurement models and uplifted their countries' competencies in digital delivery. Australia has the potential to surpass these countries by ensuring the integration across the additional strategies and initiatives is included.

ABAB recommends the development of consistent national BIM and digital delivery standards which align with the relevant international standards to provide certainty to industry.

Lessons from other Australian jurisdictions and other portfolio areas, including Defence's industry capability approaches.

The Department of Defence have created a suite of contracts led by Bob Baird and Jolanta Skawinski with the assistance of their lawyers. They have created six BIM or digital delivery models based on the integration requirements and the variety of risk profiles for each delivery or project type. Each delivery model looks at early contractor involvement and requires an overarching project team agreement similar to an overarching BIM or digital delivery protocol that takes precedence over the contract should there be discrepancies. Further discussions and investigation into the success of these procurement models should be reviewed. This is in an effort to understand the impacts they have made to mitigating risks on projects, and how the BIM and digital deliverables have been further exploited for future decision making, in either running the asset or assisting with the future procurement models or contracts.

ABAB recommend a review of the Defence procurement models combined with international models to establish the appropriate suite of contracts.

How Australia can balance its international obligations with maximising local content opportunities, including by leveraging foreign direct investment.

The construction industry is decreasing in productivity, and inconsistency in BIM and digital deliverables are fuelling the issues. Australia has had local and foreign direct investment in construction but due to the inconsistency in everything from procurement models through to the expected impacts of deliverables the industry remains sluggish. To meet the international obligations whilst maximising local opportunities we should look at how procurement can lead the construction industry into higher productivity through BIM and digital delivery.

Productivity in construction is influenced by four core areas of the public contract regulations. The areas are:

- Equal treatment of domestic and international suppliers,
- Consideration of social and environmental factors,
- Measures to enhance small and medium enterprise (SME) access to government procurement, such as splitting larger contracts into a series of smaller contracts, and
- Whole-of-life costing.

BIM and digital delivery enable every one of these core areas and by adding significance to their weighting we can meet our international obligations whilst maximising local opportunities.

Equal treatment of domestic and international suppliers.

Improving the weighting of relevant BIM and digital delivery experience on infrastructure procurement will drive equal treatment of suppliers. BIM and digital delivery are endorsed by many governments across the globe. The experience that can be gleaned from those countries is significant when compared to the local market. The experience learned and shared can add to the competencies in Australia and assist in uplifting local competition in this space. This in return helps build local opportunities and enables Australian competency to be recognised on the international stage.

Consideration of social and environmental factors.

Being recognised on an international stage also involves how our procurement uses technological advancement to make decisions. Social and environmental factors are easier to understand when overlaid in a Digital Twin. Australian States are investing in the development of the Digital Twins to better share and visualise information by government departments, agencies, and the public. When procuring infrastructure, the BIM and digital deliverables need to be standardised to deliver the information required to ensure our state Digital Twins deliver the information needed to make more informed decisions on future procurement. This requirement will drive consistency and inspire innovation for our local industry. In return this will drive greater opportunities for individuals and businesses locally and internationally.

Measures to enhance small and medium enterprise (SME) access to government procurement.

Driving opportunities for SMEs also requires procurement to utilise the state Digital Twin. As mentioned earlier, SME's are often excluded from large infrastructure projects for numerous reasons. One is the procurement of these projects is too large for the SME, and the risks for the managing contractor in managing multiple SME's becomes increasing complex depending on the project type and complexity. By using the Digital Twin to review the impacts and understand how to breakdown the projects into smaller contracts it will encourage SME's to participate. This will enhance opportunities for SME's and again, it will enable the government to understand what further information they require from BIM and digital deliverables, such as whole-of-life information for operation and maintenance contracts.

Whole-of-life costing.

Whole-of-life procurement could be a step phase for government infrastructure. Many operation and maintenance contracts are influenced heavily by the decision making made during the capital build phase. Whether it is managing a road or a bridge through to managing a building, if the capital build has not made choices to reduce the operation and maintenance costs the asset can become a burden on public spend. To reduce this likelihood, performance-based contracts could be phased in to mitigate the cost risks.

How the mitigation is achieved is by using a PIM to test and assess the asset operation and maintenance prior to construction. Basically, the PIM uses Digital Engineering techniques, such as simulations, to evaluate the performance of the asset. If a contract requires the delivery of the designed simulation that can be utilised to test the designed against the actual it opens up opportunities for the asset to be calibrated during the operational readiness phase. This opens opportunities for niche markets in the calibration phase and enables governance measures that can assist with decision making on performance contracts.

Overall, the investment into making BIM and digital delivery a weighted deliverable in government-funded infrastructure will help build opportunities both locally and internationally. The importance is on the standardisation of the deliverables to enable better decision making to take place within the Digital Twins. This is expanded in further detail when looking at whole-of-life procurement and mitigating the cost risks for operating and maintaining public assets.

Alternative procurement models, including reference to international examples.

All international examples of procurement models for BIM and digital delivery concentrate on early contractor involvement. The objective is to have contributions from the stakeholders early in an effort to reduce the risks across the entire lifecycle of the project. All contributions are building *up* the information in the virtual replica of the model to understand the design, construction, and operation and maintenance requirements. Below we have indicated some of the procurement models being used within the UK. Further investigation will be required across other countries to define what is most suitable for the Australian market.

United Kingdom

The UK have approached BIM and digital delivery from a whole of industry perspective with A BIM Taskforce which is now Digital Great Britain. Their objectives were starting with uplifting their construction industry competencies, using that competency to create an efficient and productive industry which was gauged by reducing the cost of government projects by 15-20%. This was delivered whilst building and encouraging investment into the BIM and digital delivery expertise for economic return both locally and internationally. The procurement models are based on a *be collaborative contract* or methodology which is used in differing ways across their standard form contracts. Those contracts all revolve around or are in reference to the BIM or digital delivery Protocol.

The JCT 2016 Design and Build (DB) contract family is the preferred or most popular contract for BIM and digital delivery. The BIM and JCT contract are broken into two sections which help to understand the provisions that are impacted by the use of BIM and digital delivery and suggests topics to be covered in the BIM or digital delivery Protocol.[4]

The NEC4 main contracts refer to BIM and digital delivery in a clause that is referred to as Option X10. This optional clause refers to similar suggestions as the JCT contract however they have opted for a more generic use of BIM or digital delivery protocol so it can be used across the globe.[5]

PPC 2000 multiparty contract is not specific to BIM and digital delivery however, it does allow for the UK's BIM Protocol to apply to all parties involved in the contract. This contract was used on government projects that trailed the use of BIM and digital delivery with results indicating the savings to government of 15-25%.[6]

The TCM15 contract launched by the Chartered Institute of Building provided a BIM or digital delivery ready contract that had a BIM clause and inclusions in its provisions and appendices. This contract is a further iteration based on the CPC2013 contract with alterations made based on industry feedback. Those alterations were based on modifying the outcomes to the strength of the contract being time and cost management. This contract is used for major construction or civil engineering projects.[7]

The Digital Great Britain approach has helped guide the UK construction industry in achieving better outcomes. Those outcomes are driving their productivity and economic growth for the industry, whilst creating skills that have been leveraged internationally.

[4] JCT n.d, BIM and JCT Contracts, JCT online Store, Viewed 9 July 2021, <https://www.jctltd.co.uk/product/bim-and-jct-contracts>
[5] NEC 2019, Facilitating digital collaboration in NEC4, NEC Contract, viewed 9 July 2021, <https://www.neccontract.com/About-NEC/News-and-Media/Facilitating-digital-collaboration-in-NEC4>
[6] UK Government 2011, Government Construction Strategy, UK Government, viewed 9 July 2021, <https://www.gov.uk/government/publications/government-construction-strategy>
[7] CIOB 2015, Time and Cost Management Contract, CIOB, viewed 9 July 2021, <https://d7.ciob.org/sites/default/files/No.3%20CIOB%20TCM15%20Main%20Contract%20Appendices.pdf>

6. Recommendations

For the reasons outlined in this submission, the Australasian BIM Advisory Board (ABAB) recommends that Government adopt the following points and include them in the procurement practices strategy:

Procurement model development

- ABAB recommends the use of BIM and digital delivery on all major government infrastructure projects in line with the Productivity Commission recommendation.
- ABAB recommends a suite of collaborative procurement models to be established that include digital delivery protocols, standards, and advice on live digital delivery management plans based on project size and complexity. The suite should be made to suit government department and agency procurement types such as panels, open tenders etc.
- ABAB recommends the development of consistent national BIM and digital delivery standards which align with the relevant international standards to provide certainty to industry.
- ABAB recommend a review of the Defence procurement models combined with international models to establish the appropriate suite of contracts.

BIM and digital delivery initiatives

- Acknowledge the significant benefits which will accrue from the widespread adoption of Building Information Modelling (BIM) and digital delivery in the Architecture, Engineering and Construction (AEC) and asset management sectors.
- Acknowledge the continual improvements in BIM and digital delivery technology being developed by industry nationally and internationally.
- Support the work of the Australasian BIM Advisory Board (ABAB) and other peak groups seeking to facilitate the adoption of BIM and digital delivery in Australia.
- Inclusion of the Australasian BIM Advisory Board (ABAB) in discussions with government on the direction of digital transformation in the AEC and asset management sectors.
- In conjunction with the states and territories provide funding to support the widespread adoption of BIM, including funding for an entity bringing together industry, government and academia to further research, education, and training in BIM and digital delivery (in a similar way to the Industry Growth Centre for Mining Equipment, Technology and Services METS).

Appendix 1 – About ABAB

Vision: Improved productivity and asset outcomes

Strategy: To take a leadership and coordinating role in the consistent adoption of BIM and associated integration and collaborative processes.

In May 2017, the ABAB was established by and consists of the Australasian Procurement and Construction Council (APCC) and Australian Construction Industry Forum (ACIF), NATSPEC, buildingSMART and Standards Australia. This partnership of National policy and key standard setting bodies represents a common-sense approach because of the synergies that exist in and between each of the organisation's areas of responsibility in the built environment. It will also support a more consistent approach to the adoption of BIM across jurisdictional boundaries.

The ABAB is a first for the Australasian building sector with government, industry and academia partnering to provide leadership to improve productivity and project outcomes through the adoption of Project Team Integration (PTI) and Building Information Modelling (BIM).

The ABAB is acutely aware of the need for optimal delivery of outcomes that eliminate waste, maximise end user benefits and increase the productivity of the Australasian economies. The Board has evolved from a previous APCC–ACIF collaboration established in 2015 on a BIM Summit. This Summit produced a number of resources to support the adoption of BIM – refer to www.apcc.gov.au for copies.

The members of the ABAB recognise that without central principal co-ordination there is a significant risk that fragmented development of protocols, guidelines and approaches will lead to wasted and duplicated effort, inefficiency, including unnecessary costs and reduced competitiveness across the built environment.

The consistent adoption of BIM across Australasia provides an important opportunity within a broad and dynamic digital economy for the built environment, where good advice provided at the right time can positively shape and influence quality private sector and Government community outcomes. Positioning Australasia as BIM leaders in the region will make us more competitive in the global infrastructure marketplace.

BIM resources to support construction projects.

The ABAB is focusing on three priority projects to further support the consistent approach to the adoption of BIM across jurisdictional boundaries:

- *Exchange Information Requirements* (client specifications) - will provide an essential foundation to assist the Australasian construction industry by creating a common framework and language for everyone involved in the construction process.
- *Intellectual Property Framework* - will assist with education and collaboration across Australia; it will demystify and simplify what is required by providing a national framework.
- *BIM Process Consistency* - will identify and promote which BIM elements should be consistent across Australasia to ensure the optimisation of BIM benefits and therefore eliminate waste in construction practices.

A number of other projects are planned, including a common set of principles for BIM strategies across Government, and clarifying BIM roles and responsibilities. The outputs from these projects will help the construction industry navigate through the new technologies and systems, to ensure that the benefits of BIM are realised in construction projects. Refer to NATSPEC website (http://bim.natspec.org/) for a considerable list of

completed projects by partnering organisations that support the development and adoption of BIM in the built environment in Australasia.

Exchange Information Requirements Project

The goal of the ABAB Exchange Information Requirements (EIR) Project is to provide guidance for clients, their agents and lead consultants on formulating and defining their information requirements for building and infrastructure projects they are planning.

Clearly defined information requirements are an essential prerequisite for clients to receive the information they need to make key business decisions about the project, and manage the asset when complete. They allow consultants and contractors to define their scope of services more accurately and with greater certainty, resulting in fee proposals or quotations with lower built-in contingency costs. Clearly defined EIRs can also be used to validate the information delivered.

While EIRs can relate to many aspects of a project, the proposed Guide will focus on defining deliverables relevant to asset management and facility management (AM/FM) activities; in particular: on as-built models and digital asset data. The Guide will outline key concepts and principles applicable to defining EIRs, and provide information to support decision making and priority setting during the process.

BIM Process Consistency Project

The goal of the ABAB BIM Process Consistency is to identify and document which client BIM-related elements should be consistent across Australasia. Sharing of practices and templates will drive consistency and create standard practices. Other objectives include identifying what can and cannot be consistent across Australian State Agencies, and consider scalability to accommodate different size projects.

The focus is on information requirements and contract documentation; a survey and analysis of the contents and scope of existing BIM Standards defined by participating State Agencies would enable the identification of a framework of BIM process, technology, and policy items.

Potential for Growth through Funding

While the ABAB is successfully delivering on its objectives, the speed of progress is limited to the in-kind support and contributions of its members. Government funding is desirable to ensure the timely development of the necessary protocols, standards, and tools for optimisation of the benefits of BIM.

All Australian Governments are faced with challenging fiscal environments. BIM is a process that will reduce risk, reduce project contingencies, drive productivity, and make Australian businesses more efficient and competitive. BIM on Government projects has the potential to deliver substantial productivity dividends and savings that can be redirected by Governments to frontline services.

The Federal Government is not yet a member of the ABAB. It is a situation that members of the ABAB wish to change by welcoming the involvement of committees, departments, and agencies.

Appendix 2 - BIM and digital delivery as an agent of change in the construction industry

The Australian construction industry at present is characterised by two exemplary issues dominating national consideration. The first is a result of fires in cladding systems on new buildings locally in Victoria and internationally in London. The issue is building product compliance, that is the quality and performance characteristics of building products that satisfy Australian construction standards, and an issue of major concern for public safety.

The second issue, much larger and more strategic, is the focus of all state governments on updating and expanding infrastructure. Population pressures, lack of asset maintenance and unmet supply, have resulted in an urgent priority to improve particularly transport systems.

Internationally, Western nations have adopted these technologies to address a worldwide reduction in construction industry productivity, as well solve these endemic construction issues. In countries like the UK, they are using their proactive expertise in these fields to sell their services around the world. Australia lags significantly behind and the creation of ABAB is a key action by Industry to ensure a consistent national adoption of digital technologies.

What is the problem that BIM is addressing?

The need for the use of BIM has arisen due to a range of factors including:

- Complexity of large projects – the need for coordination – no one person or team can know all of the details of the project
- Construction and asset management industries resistant to change
- Inefficient work practices
- High costs incurred through requests for infromation (RFIs), reworks, clash detection on site during construction and resulting work arounds
- Poor Workplace Health and Safety – few industries accept the level of death and injury which occur in the construction industry
- Silo approach where trades and professions do not communicate and coordinate well
- Issues with loss of information over project life and between stages
- Those responsible for different parts of the process (eg planning, design, construction, operation and maintenance) do not collaborate effectively to achieve the best overall outcome.

Flyvbjerg and others have documented the particular failings in the delivery of large complex 'megaprojects' across the world and the associated cost overruns and time delays (Source: *Bent Flyvbjerg, 2014, "What You Should Know about Megaprojects and Why: An Overview," Project Management Journal, vol. 45, no. 2, April-May, pp. 6-19, DOI:10.1002/pmj.21409*).

While cost overruns on an individual project may not result in a direct cost to the taxpayer (depending on contract arrangements) it is likely that such overruns and losses will result in higher contingencies in future projects and therefore greater cost in the long run.

The poor relative efficiency and productivity in the construction industry and the frequency of cost overruns and time delays in major projects is a significant issue for the economy. A global study by McKinsey found that between 1995 and 2011 productivity per worker in manufacturing nearly doubled while in the construction industry productivity has remained flat (Source: Digital Australia – Seizing opportunities from the Fourth Industrial Revolution, McKinsey, 2017). The discussion paper refers to a more recent McKinsey report on digitisation of Australian industries and the low level of digitisation in the construction industry.

What does BIM do?

BIM acts as a single point of truth. The information contained in BIM and the three dimensional visualisation enabled by BIM improves coordination and communication to:

- Allow for better design
- Aid decision making
- Improve clash detection
- Improve coordination between trades/professions
- Improve speed and responsiveness of changes, and
- Proactively identify safety issues

Benefits

The collaborative and digital aspects of BIM unlock greater efficiencies and productivity. Other key benefits of BIM include: more efficient and on-time project delivery; increased accuracy in cost estimation; reduced project risk; improved safety; improved built outcomes; improved asset management; and reduced construction and operational costs.

Evidence of cost savings from the use of BIM has been growing steadily internationally. While much of the information on the exact savings from the use of BIM processes is often considered commercial in confidence, some specific quantitative information has been published. Some of the best information of cost reductions comes from the United Kingdom (UK) where government agencies have achieved construction cost savings of 12-20 per cent from the use of BIM and other complementary strategies to improve productivity.

BIM in Australia

Allen Consulting Australia 2010

In 2010 Allen Consulting Group published the results of its industry sponsored study into the impacts of BIM on productivity. The study's findings reported that the accelerated and widespread adoption of BIM on the Australian economy was likely to increase GDP by 0.2 basis points in 2011. Whilst this may not seem much, the study also noted the likelihood of a cumulative effect given the likely increase in the pace of adoption by 2025. This would mean an increase of 5 basis points in comparison to what they describe as a "business as usual" scenario.

Productivity Commission Report into Public Infrastructure 2014

The Productivity Commission Report into Public Infrastructure 2014 recommended (Recommendation 12.5) that government clients should use BIM to help lower costs for complex infrastructure projects. To facilitate the consistent use of BIM by public sector procurers, Australian, state and territory governments should:

- facilitate the development of a common set of standards and protocols in close consultation with industry, including private sector bodies that undertake similar types of procurement
- include in their procurement guidelines detailed advice to agencies on the efficient use of BIM.

Australian Infrastructure Plan (AIP)

In the Australian Infrastructure Plan (AIP), Infrastructure Australia made the following recommendation:

> *Recommendation 10.4:*
>
> *Governments should make the use of Building Information Modelling (BIM) mandatory for the design of large-scale complex infrastructure projects. In support of a mandatory rollout, the Australian Government should commission the Australasian Procurement and Construction Council, working with industry, to develop:*
>
> - *Appropriate guidance around the adoption and use of BIM; and*
> - *Common standards and protocols to be applied when using BIM.*

Federal Government

One of the leading proponents of BIM in Australia is the Department of Defence which has been using BIM for infrastructure projects for a number of years and is an active participant in industry groups supporting the use of BIM.

National Working Groups

National action is underway to progress a harmonised government approach to the use of BIM on linear infrastructure (e.g. roads and railways). The National Digital Engineering Working Group (NDEWG, a sub-group of the Council of Australian Governments (COAG) Infrastructure Working Group) has been established in response to concerns from industry about divergent BIM approaches developing between jurisdictions, particularly in relation to linear transport infrastructure.

The COAG Transport and Infrastructure Council has endorsed and publicly released the National BIM Policy Principles developed by the NDEWG.

The Australasian Procurement and Construction Council has also established the Australasian BIM Advisory Board (ABAB). In line with AIP recommendation 10.4, the ABAB is taking a whole of construction industry approach to the national adoption of BIM, whereas the NDEWG is focussed on BIM for transport projects. (See Appendix 1 for further information on ABAB and its work).

States and Territories

Most states and territories have begun adoption of BIM on a project-by-project basis, resulting in bespoke approaches which favour the provider rather than a consistent whole of government approach. New South Wales (NSW), Queensland (QLD), South Australia (SA), Victoria (VIC), and Western Australia (WA) have used BIM on significant infrastructure projects, particularly hospitals, but typically only in the design and construction phases. The use of BIM is now progressing to the asset management phases of some projects (such as the Perth Children's Hospital and New Royal Adelaide Hospital) and also to linear transport infrastructure projects (such as roads and railways).

In its State Infrastructure Plan released in March 2016 Queensland committed to the use of BIM on all major infrastructure projects by 2023.

Examples of the use of BIM across the states and territories include:

- NSW Health Infrastructure since 2013
- TfNSW Digital Engineering Framework implemented in stages since 2018
- Roads and Maritime Services – Central Business District (CBD) and South East Light Rail projects and the Woolgoolga to Ballina, Pacific Highway upgrade (NSW)
- Perth Stadium and Perth Children's Hospital (WA)
- Joan Kirner Women's and Children's Hospital and Melbourne Metro (VIC)
- Adelaide CBD High School and Port Augusta Prison Accommodation expansion (SA)
- Palmerston Regional Hospital and Alice Springs Hospital upgrades (NT).
- Ipswich Motorway (Rocklea to Darra) Upgrade (QLD)

BIM internationally

BIM is increasingly used around the world and has been mandated in a range of countries including Finland, Norway, Singapore, Netherlands, South Korea, Denmark and, most notably, the UK. As part of its 2011 Construction Strategy, the UK Government mandated 'Fully Collaborative 3D BIM' (with all project and asset information, documentation and data being electronic) as a minimum by 1 April 2016 on all publicly procured projects. A critical part of delivering this objective and realising the full benefits of BIM, was working to align the

interests of those who design and construct an asset using BIM with those who subsequently manage it using the same model.

Take up of BIM

A number of major companies have invested in BIM capability for design and construction as they see this as both a competitive advantage and a significant cost and time saving, reducing rework and establishing a single point of truth. However, industry representatives have indicated that without leadership from government to establish a consistent approach, the adoption of BIM has been limited and risks divergent approaches to BIM both between sectors and between states.

There has been limited government demand for the use of BIM and as a result its use for operations, maintenance and asset management has been extremely limited. A number of reasons for this limited demand have been noted:

- lack of awareness
- reluctance to embrace change
- uncertainty around the level of benefit
- need to make an initial investment in building capability and capacity to realise long term benefits, and
- lack of experience in applying BIM.

Experience has shown that it can take some time to realise the full benefits of BIM implementation. There are likely to be establishment costs associated with the implementation of BIM for government and industry. As adoption becomes widespread, savings on individual projects will offset the costs associated with implementation for government.

Next Steps – What do we want government to be doing?

The challenges to increase the rate of digitisation in the AEC and asset management sectors are clear and the benefits of doing so will be significant for both governments and the broader economy.

ABAB and a variety of organisations and individuals have been working to progress the use of BIM in Australia. Progress has been made. However, the rate of adoption for digital technologies in the AEC and asset management sectors is lagging behind other parts of the world. Australia risks being at a competitive disadvantage locally and on the global stage if this is not addressed.

ABAB recommends that the Federal Government include an acknowledgement of the clear benefits of increased digitisation and the adoption of BIM in the AEC and asset management sectors in the Digital Economy Strategy.

Governments at all levels fund infrastructure and services and therefore, there is a significant benefit to be gained through better outcomes and more efficient infrastructure delivery and operation. The broader benefits to the whole economy of widespread adoption will be felt through improved productivity and efficiency. This is particularly true of the Construction industry as a major contributor of the economy through employment and other means.

Unless large clients such as governments require the use of BIM on projects then private sector contractors will continue to use BIM for their own limited purposes during design and construction. This will not provide the benefits that are available from the full implementation of BIM throughout the asset lifecycle.

ABAB recommends that the Federal Government include a request for the use of BIM on all major infrastructure projects to encourage the spread of BIM throughout the AEC industry. In the absence of a clear signal to the AEC sector, the adoption of BIM has been slow and varied. There is a risk of divergent approaches and duplication of effort through the current fragmented approach.

ABAB recommends that the Federal Government provide funding and support for the development of consistent BIM national standards which align with the relevant international standards. ABAB also recommends that the Federal Government support the work already underway through the Australasian BIM Advisory Board (ABAB) and other peak groups (such as NATSPEC and buildingSMART) to facilitate the adoption of BIM in Australia.

There is significant work to be done to maximise the benefits from the implementation of BIM in Australia. For this reason, ABAB recommends that the Federal Government work together with the states and territories to provide funding for an entity bringing together industry, government and academia to further practice, research, education, and training in BIM (in a similar way to the Industry Growth Centre for Mining Equipment, Technology and Services (METS)).

ABAB is a significant collaboration of peak bodies in the sector and as such would welcome the opportunity to further engage with the Federal Government on the development of its Digital Economy Strategy and the inclusion of BIM as a significant element in the future of the Australian economy.