Submission to the Parliamentary Inquiry into the role of smart ICT in the design and planning of infrastructure

Summary: buildingSMART submits that the Federal Government should require the adoption of BIM in all Government procurement projects. This would place Australia at the centre of innovation and global best practice in smart ICT in the design and planning of buildings and infrastructure.

Introduction and overview

This Submission provides a response to the Standing Committee on Infrastructure and Communications' call for submissions for its Inquiry into the role of smart ICT in the design and planning of infrastructure.

buildingSMART contributes its views in the interests of promoting the policy settings that best support and improve construction and building industry standards, productivity and competitiveness in Australia and New Zealand.

buildingSMART welcomes the opportunity to submit its views to the Committee on these important issues, and to offer its guidance into the adoption of Building Information Modelling (BIM) processes and the potential benefits we believe the Committee should consider.

Background – buildingSMART

buildingSMART is a not-for-profit industry group consisting of organisations committed to seeing BIM adopted nationally. The overriding objective of buildingSMART is that we want to produce much better buildings and infrastructure - a built environment that is valued by the community, that meets real needs, that performs better, that impacts less on the environment, that takes less time and money to build and to use. Within that context, buildingSMART has as a specific commitment to support the use of open standards for sharing information across the supply chain and improving processes in the delivery and management of buildings throughout their life cycle.

Our members are drawn from across the industry, including:

- Building owners and developers (both Government and private);
- Architects, engineers and related design, planning and authority professionals;
- Builders, sub-contractors, product and materials suppliers; and
- Related service providers.

Our Board includes industry experts and academics. We do not seek to make a profit, but rather provide our services to buildingSMART pro-bono and in addition to our day-to-day businesses – each of us simply have a personal commitment to seeing the production of better buildings and infrastructure across Australia and New Zealand.

We are part of an international organisation, with 17 chapters across the globe.

Terms of reference: The Committee is to inquire into and report upon the role of smart ICT in the design and planning of infrastructure

buildingSMART has been engaged in investigating and advocating a smart ICT agenda at a Federal level and also through individual State Governments since 1997. We are committed to working with Governments across to the country with the aim of amending procurement policies to require the use of BIM on State and Federal Government infrastructure projects.

Term of reference a): Identifying innovative technology for the mapping, modelling, design and operation of infrastructure

Building Information Modelling (BIM) is a digital 3D intelligent model of a building, or other constructed facility. It is the specific digital technology for the construction and infrastructure sectors as the entire economy moves into the digital age. The construction industry is one of the last sectors of the economy to adopt digital technologies that have revolutionised car production, aerospace and advanced manufacturing. The move from traditional documentation to the new digital modelling approach, with vastly improved collaboration and enhanced deliverables, is a major worldwide focus and one where Australia needs to play a major role.

BIM facilitates the creation of an accurate digital prototype that contains the rich data detailing all stages of the construction lifecycle. Originally, the term applied only to the delivery of building construction – particularly commercial towers, industrial facilities or high-end public facilities like hospitals with complex services – but it is now being successfully used on many types of infrastructure and benefiting end users and asset owners through its ability to greatly improve operations and maintenance controls.

BIM is a smart ICT process that can integrate the data during the design, construction and maintenance of a project to be shared amongst all partners. While some designers, constructors and their consultants still rely on two-dimensional drawn plans to advance their project, those at the forefront of BIM have moved through 3D modelling, 4D (adding time or staging to 3D), 5D (adding cost data to 3D) and 6D (where the 3D data is populated with future asset information).

This is achieved through a mutual exchange of data, resulting in a complete digital description of a project. The BIM digital description is then available for the entire life cycle of a project, providing the client or owner with a high quality, updated "as-built" digital model of their asset.

BIM is based on the idea that a building is constructed twice: virtually first and physically second. This integrated approach resolves many of the inefficiencies that take place throughout the industry by improving collaboration to help identify issues during the design phase, allowing service coordination and clashes to be managed and virtually resolved prior to commencing actual construction works.

The need for vendor-neutral (non-proprietary) methods of exchanging information throughout a project has been recognised through the development of a consistent set of standards in BIM. buildingSMART is the only global organisation to deliver those standards, spanning both buildings and infrastructure. These will allow users to work seamlessly across a broad range of proprietary software tools.

There is widespread agreement that digital technology offers enormous benefits when used to develop effective ways of representing the physical world in a digital form. The building, infrastructure and construction industries all understand the value of the BIM process in improving efficiency, quality and cost of project delivery.

buildingSMART supports and encourages the ever-increasing implementation of BIM across Australia, with existing projects providing useful guidance and highlighting the significant benefits to be gained from implementing this technology:

- The Commonwealth Government Department of Defence is already using BIM and is looking to implement the 'early contractor involvement model' as standard practice by 2016.
- The Sydney Opera House is currently introducing a BIM asset management system. This has been a very complicated project given the Opera House's location and history. The introduction of this system will change their facilities and operations management from reactive to proactive.
- In NSW, Transport for NSW is another leader in Australia's BIM adoption. This year they will create a dedicated BIM implementation team. Digital Engineering is being used on a range of transport projects, but to this point is has mostly been led by industry, not Government. Transport for NSW have also included BIM requirements on their latest major projects such as North West Rail Link, the Wynyard Station Upgrade, as a part of the Sydney Metro and on elements of WestConnex.
- NSW Health is also developing its own BIM protocols.

Given the rapid uptake of elements of BIM in Australia, buildingSMART notes that it is also now becoming 'business as usual' for a large number of contractors seeking to create savings and efficiencies, and drive greater collaboration, on projects. Projects that have used elements of digital engineering include:

- Royal Adelaide Hospital Project
- Moorebank Intermodal Terminal Project
- Barangaroo development, including Wynyard Walk
- North West Rail Link
- Southern Freight Link
- Regional Rail Link Victoria
- South West Rail Link
- Auburn Stabling Yard
- New Generation Rolling Stock Stabling, Ipswich
- Sydney CBD light rail early works
- Perth Children's Hospital
- Perth Stadium
- Perth Museum

Terms of reference b) & c): Identifying the new capabilities smart ICT will provide AND examining the productivity benefits of smart ICT

The benefits from promoting the widespread adoption of BIM into Australia and New Zealand's building and construction industries are extensive. Businesses at all levels in the construction supply chain working on a Government project would collaborate and openly share digital information. This would help to strip out waste, mistakes and lost time. Specific capabilities and benefits include:

BIM changes the way people work together: BIM enables different parties to understand each other's data, creating more informed and unified teams. When a whole team is linked by a single data source, the previously siloed functions, consultants and subcontractors can see beyond their own interests to a more holistic view. BIM provides all involved with a 'single source of truth' with which to collaborate more successfully.

Better design and solutions: BIM enhances performance. It makes possible swift and accurate comparison of different design options, enabling development of more efficient, cost-effective and sustainable solutions.

Savings on time and cost: Substantial time savings can be achieved by agreeing the design concept earlier in project development to eliminate late stage design changes, avoiding clashes and using standard design elements when practicable.

Community responsibilities: BIM can be used to inform local community members, workers, or other high-profile stakeholders of the detail of the project before it is delivered. This is particularly beneficial for Government projects or those with a major public interface. In addition, crowd behaviour and fire modelling capability enable designs to be optimised for public safety.

Trade and Industry: If we do not expand the adoption of BIM in Australia now, foreign investors will, and Australia will lose a valuable opportunity. Equally, BIM has the potential to become a valuable export for Australia.

Environmental benefits: Adoption of BIM in procurement leads to many sustainability benefits. It involves less material waste, more efficient design from an energy consumption perspective, low carbon consumption, the use of passive design and the use of sustainable materials. Importantly, materials are not over-ordered, reducing waste.

BIM and facilities management: Facility managers are continually faced with the challenge of improving and standardising the quality of the information they have at their disposal. There is no one-size-fits-all application, as the requirements of facilities management practices are widely diverse. BIM for facility managers offers a new level of functionality for the management of all infrastructure projects and the physical assets within them. BIM provides a unified digital repository of all components, which can become an electronic owners manual.

BIM and the digital built environment: Integrating BIM or construction information with spatial data leads to the wider concept of a digital built environment (ultimately, a new piece of 'infrastructure'): a complete digital model of the natural and built environment that is accessible to all stakeholders. It will be a permanent and ever-changing asset of the community and Government. It will be used to manage our transport, energy and water flows, as well as for emergency services and disaster recovery. In this context, the use of BIM will enable us to plan, design, test, communicate and approve all new activities within our cities before the perfected ideas are manifested in the real world. This will deliver better outcomes, more quickly at less cost and with lower risk. buildingSMART is currently preparing a joint Paper that addresses this concept in greater detail, due for completion in mid-July, and can provide a copy of that to the Inquiry at that time.

Productivity Commission Report

The Productivity Commission report, published in 2014, report is strongly supportive of BIM and devotes an entire recommendation supporting it. The recent ConstructQ workshops facilitated by the Queensland Government and attended by industry arrived at similar findings.[1]

The Productivity Commission's report suggests that the Government should lead its development in Australia.

> *Recommendation 12.5*
> *For complex infrastructure projects, government clients should provide concept designs using Building Information Modelling (BIM) to help lower bid costs, and require tender designs to be submitted using BIM to reduce overall costs.*
>
> *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; and*
> - *include in their procurement guidelines detailed advice to agencies on the efficient use of BIM.*

The Productivity Commission's report outlines how, given the benefits that can stem from the use of BIM, some government clients have mandated its use for building and infrastructure works, for example in the UK and Singapore.

Term of reference d): Harmonising data formats and creating nationally consistent arrangements for data storage and access

This goes to the heart of buildingSMART's work to develop open standards for sharing information across all construction activities and integrating those with spatial data standards and support access to spatial data. With those standards in place, smart ICT will enable infrastructure development agencies to plan, design, test, communicate and approve all new activities within our cities before the finalised ideas are manifested in the real world - to deliver better outcomes, more quickly at less cost and with lower risk.

[1] Queensland Government, *ConstructionQ Forum Report*, 2014, p11

The challenge is how to securely integrate millions of separate models under the control of millions of different entities using many different versions of software and hardware and do it with the least administrative burden.

Harmonising data

As yet, there are minimal laws governing the 'virtual world'. Left to the market, digital infrastructure will be governed by a wide range of often-conflicting rights, responsibilities and restrictions, including different corporate terms of use, licences and contracts. Or, in an even more complicated outcome, each jurisdiction – be it local, State, Federal or internationally - could have their own set of rules and laws. This could lead to a total lack of ability to work with other organisations or Governments in digital infrastructure.

When each Australian State built their own rail gauges, the respective Governments had no idea of the long-term productivity losses that would follow. On the cusp of a revolution in smart ICT for the design and planning of buildings and infrastructure, we have a responsibility to ensure a uniform legislative framework is developed.

A framework from the Government would provide consistent guidance about best practice implementation of BIM. This framework would enable businesses to self-innovate and would empower greater efficiencies, productivity and quality control.[2]

Data storage and access

A proposed solution from VANZI (the Virtual Australian and New Zealand Initiative) is to create new legal entities: 'Property Data Banks'.[3] These would be empowered to hold and connect the official models of each property into a secure fully-integrated digital built environment, with rights of access mirroring our real-world rights, and standardised data exchange formats for use and trade. It would be like having your own property model held on your own computer, but more secure; where rights of access and use and standards of data exchange are simple and clear. buildingSMART endorses this model.

buildingSMART believes that these protocols are appropriate if the Property Data Bank Network is operated on commercial principles. Just like traditional banks compete to hold and transact our money, new organizations should compete to hold and share our property models.

The traditional role of the spatial industry has been the management of land ownership and title, enacted through the discipline of land surveying. This has typically been based on

[2] Michael Haines, *http://www.vanzi.com.au/*
[3] Ibid

paper drawings held in State and Commonwealth land registry repositories, but there is a program underway to move towards digital technologies for both 2D and 3D cadaster.[4] The Government and infrastructure industries need to ensure that spatial information can be accessible though a BIM interface. Smart ICT in infrastructure can only work properly when BIM allows an asset to be contextualized, including understanding its place in the digital built environment, including its urban space, utilities, civil infrastructure and transport.

Term of reference e): Identifying international best practice in the use of smart ICT in the design and planning of infrastructure

Other nations around the world provide a framework, guidance and lessons learned for Australia and New Zealand, including the need for government involvement in smart ICT. In the Western world there is already a leader and great advocate in the use of BIM in the UK Government. The UK Government has provided leadership in telling the market what the Government wants; not how to do it. Aligning Australia to the UK's success in this field will drive reform, improve projects and set a new reputation for infrastructure delivery here.

In 2011, the United Kingdom Government announced that it would require fully collaborative 3D BIM as a minimum on all Government construction projects by 2016. The UK Government believes that BIM is not about a specific technology or product, but a process to give clients all the data that is of use to manage the facility after handover.

As a result of their smart ICT policies, the UK Government is expecting to achieve a 20% reduction in procurement costs for government buildings compared with traditional practices. Schools, hospitals, utility plants, railway stations – all being built in a digital model, shared with all stakeholders, tested for longevity and purpose and ensuring surety of delivery, before ground is broken or the first brick is laid on site. Australia needs to introduce reform to construction methods to achieve similar savings.

Other government jurisdictions that already require the use of BIM for government building procurement include the United States, Norway, Finland, Denmark, Germany and France. In our region, China, including Hong Kong (SAR), South Korea and Singapore have taken steps to achieve BIM implementation through a planned approach. For example, the Singaporean Government is progressing toward applying a mandate for BIM, offering incentives to those willing to be the early pathfinders towards a goal of increased industry adoption, and ultimately full BIM submissions. The UK, France and Singapore all have Ministers who are responsible for BIM.

[4] ICSM, 2015, *Cadastre 2034: Cadastral Reform and Innovation for Australia - A National Strategy*, Geospatial Frameworks Pty Ltd, Darlington, WA, March 2015.

Term of reference f): Considering the use of smart ICT in related fields, such as disaster planning and remediation

The spatial industry is considered to be the most critical for the future of humanity. Water security, food security, management of epidemics, climate change, extreme weather, disaster management all rely upon the services and technologies of the spatial industry for vital decision support. When this information is contextualized in BIM, smart ICT and a 'digital built environment' will ultimately form a new piece of infrastructure.

It will be a complete 3D Computer Model of the natural and built environment for use throughout the property cycle, including the planning, design, construction, financing, insurance, management and leasing, to sale and decommission. It will also be used to manage our transport, energy and water flows, as well as for emergency services and disaster recovery.

This will be of increasing significance as governments across Australia and New Zealand work to develop and improve disaster resilience and mitigation strategies to tackle the natural disasters which face our country, including natural resource depletion, food and water insecurity, energy shortages, environmental degradation, natural disasters response, population explosion, and, in particular, global climate change.

As Governments increasingly focus on disaster preparedness, community awareness, capability development and disaster response and recovery, smart ICT solutions and the digital built environment will be able to play a strategic and sustainable role in addressing these major challenges to society.

Term of reference g): Considering means, including legislative and administrative action, by which government can promote this technology to increase economic productivity.

buildingSMART believes the market will eventually adopt BIM for all infrastructure and building projects. However, it would be short-sighted for the Government not to seek to accelerate that development, to proactively exploit the immediate benefits, better outcomes, cost savings and industry improvements available through early adoption via government procurement. In Australia and New Zealand, BIM is currently being driven strongly by BIM user communities using proprietary solutions, rather than existing common protocols and standards. There is a need for Government to take a strong stand to ensure national consistency.

Without government leadership, different states, government departments and industry players could adopt different standards – potentially the 21st century equivalent of states adopting different rail gauges, leading to missed opportunities and a loss of productivity.

There are currently no policies to drive the effective use of BIM across the whole of the infrastructure asset lifecycle in Australia.

In a report released last year, the Queensland Department of Transport and Main Roads outlined how they expected professional engineers to evaluate risks and benefits of innovation that lead to 'value for money' solutions.[5]

buildingSMART submits that the Federal Government should adopt the same principle, including seeing innovation as an opportunity to improve Australia's future. The Federal Government should actively encourage innovation that provides the best value-for-money, including in overseas procurement models and methods.

The Bill could be amended to state that innovation should be sourced from around the world. It should be sustainable and clearly related to tangible and measurable benefits.

Financial issues

All Australian Governments are faced with challenging fiscal environments. BIM is a money-saving concept that will improve the budget, drive productivity and make Australian businesses more efficient and competitive. Requiring BIM on Government projects would deliver substantial productivity dividends for the budget of participating jurisdictions.

There are no up-front cost implications. buildingSMART is simply requesting the Government's support by way of changes to its procurement practices, a move which in our opinion would be cost neutral.

Conclusion

buildingSMART thanks the Committee for the opportunity to provide its views in relation to the Bill. buildingSMART would be pleased to provide further information or a verbal submission at the Committee's request:

John Mitchell
Chairman, buildingSMART
john.mitchell@buildingsmart.org.au
+61 410 318 131

[5] *Engineering Innovation In the Department of Transport and Main Roads*, September 2014, p 5.