



Submission
Smart ICT for Design and Planning.

Prepared for
Standing Committee on Infrastructure and Communications

July 2015

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31st July 2015

Subject: SMART ICT

On behalf of Bentley Systems Pty. Ltd. (Bentley), I am pleased to present this submission to the Standing Committee on Infrastructure and Communications.

This submission is based on the terms of reference, with additional comment provided on the exponential benefits that can also be obtained in the Operations and Maintenance phases of Infrastructure; through the application of Smart ICT in combination with improved processes, policies and standards during the design and planning stages. In order to realise the full benefits we would submit that Infrastructure owners in Australia need to take a whole of asset lifecycle approach to Infrastructure to achieve:-

- Reduction in the current Infrastructure investment gap
- Optimal asset utilisation and end user experience
- Reduced total cost of asset infrastructure; Totex. (Capex and Opex)
- Increasing the lifetime value of infrastructure by extending asset lifetime and reinvesting with a whole life-cycle perspective on costs

In our submission we address

- Technology – What it can do and where it can be applied to add value
- Standards, Policies and Processes
- Lessons learnt and improvements that we believe can be applied in Australia and why
- References where appropriate

Yours sincerely,

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1. Introduction

Whilst this particular submission relates to the application of Smart ICT to improve the design and planning of Infrastructure, Bentley Systems does not believe that the broader economic benefits of improved asset delivery and subsequent performance can be achieved by taking a siloed approach to the different phases of the infrastructure lifecycle, or by applying isolated ICT solutions to those phases. Infrastructure is arguably the most important area for investment in Australia and a whole of asset life approach, for existing infrastructure and green-field projects, must be applied to derive a more comprehensive return on the national asset investment.

By whole of life we mean ensuring that the data and information created at the early stages of the infrastructures lifecycle; feasibility - detailed design – fabrication – construction, can be captured, managed, maintained, shared, reused and repurposed during later stages; commissioning, operations - maintenance. Currently we see major Government projects issued to market with contracts that have no requirement for the data and information related to the physical infrastructure to be submitted in a way that can meet these fundamental objectives.

In the absence of the infrastructure owners (government) clearly specifying their whole of lifecycle information requirements, before contract, the current situation will prevail where the contractors, quite rightly, will select the ICT tools that best enable them to meet their immediate contractual deliverables at the lowest possible cost. This invariably does not result in a lower total cost of asset to the owner, neither across the project delivery phase, or the operation and maintenance lifecycle.

The qualified application of Smart ICT can and does deliver quantifiable returns of investment in the areas where it is applied, however ICT is purely an enabler and not a complete solution to the current challenges inhibiting better economic outcomes from infrastructure projects in Australia. Incremental benefits can be achieved through the application of smart ICT however Australia's future competitive economic advantage will depend on improving the capital expenditure or design build phase of Infrastructure in combination with increased focus on the investment in existing Infrastructure, to deliver an increase in overall service levels and utilisation, at a lower total cost and at the same time extending the lifetime value.

Taking a whole of lifecycle approach and demanding that data and information be provided in a way that it can be effectively managed will ensure that, the physical infrastructure in the field is accurately reflected in the information stored in the head office systems and that both the physical and virtual information are in compliance with the relevant legislative or organisational policies, processes and standards. This approach requires the development of a long-term sustainability plan that includes the operations and maintenance requirements of infrastructure assets and the associated, predictable, ongoing cost for future taxpayers.

Bentley Systems recognises that the answer to improving the status quo is by nature complex and multifaceted, and that different asset classes and owners (Civil, Building, Utility) have different design, build, operate and maintain lifecycle costs. These disciplines require alternate strategies to achieve optimum performance. Regardless of the asset class, combining the Capex and Opex for a total expenditure approach to Infrastructure asset management delivers a far better outcome for the public purse, economic growth and improved quality of life.

Finally, it is crucial to remember that operations and maintenance is where the users experience is realised, and this touch point is what will shape their willingness to pay for services and support funding sustainability. Improved asset management of existing infrastructure could provide a revenue stream for sustainable investment into the future.

2. Terms of Reference

Taken from the Parliament of the Commonwealth of Australia media release 27th May 2015

1.1 Identify innovative technology for the mapping, modelling, design and operation of infrastructure;

Generally in infrastructure the asset is the core business rather than containing a business. As such any ICT led strategy must cover the full life cycle of the asset being considered.

There are many individual ICT applications that provide innovation across individual phases of the design, build, operate and maintain lifecycle. Whilst we have identified a selection of these in this section, in isolation, without be able to share the information created by these applications, the benefit is not optimised.

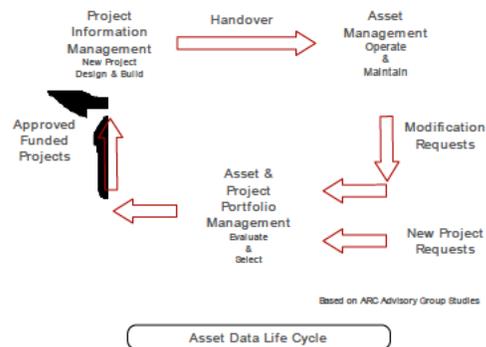
We would promote leveraging the power of cloud based processing combined with the creation of a common modelling / project / data and performance environments to improve mapping, modelling, design, deliverables and data, provides more value than any single software tool. The real value from the application of smart ICT is created when the input and intelligence from the individual project delivery phases is created collaboratively, managed and maintained during the lifecycle, with the output federated and made easily available to all stakeholders.

1.1.1 Common Environments

Creating common environments for projects enables the management of engineering information across its complete life and by providing a connected user experience and access to current, valid and approved information, reduces the cost and risk associated with delivering projects.

The lifecycle diagram here illustrates the distinct phases of infrastructure information and covers:

- Ongoing management of an asset
- Strategic view of asset portfolios
- Projects that generate new or update existing assets.



The common environment approach from Bentley Systems includes distinct elements

1. **Common Modelling Environment** – Unique in its cross-discipline span, with breakthrough capabilities for iterative collaboration on industrial-scale projects, supporting design modelling analytical modelling and construction modelling. All Bentley modelling applications now support functional components – parametrically defined, intelligent objects with appropriate contextual behaviour across schematic, modelling and deliverable instantiations. To advance computational-intensive analytical modelling for other applications, cloud-provisioned optioneering (see 1.1.2) is enabled through our common project environment solution.

2. **Common Project Environment** – Based on the world’s most widely used Engineering work in progress platform (Bentley ProjectWise) the Common Project Environment extends capabilities beyond Design Integration Services to the entire project ecosystem. This environment reaches all project participants to support cloud-based collaboration; enabled through project profiles, authorisations, project playbooks, and learning paths. Providing a sharing service allows cooperating organisations (client and contractor) to federate their respective distributed project collaboration environments. In this environment a catalogue service supports project-specific catalogues of managed specifications and functional components. New apps empower field-based workflows, based on “open source” mobile information containers (iModels) that deliver not only visualisation, but also visibility.

A new managed issue resolution service, delivered to field users helps users to resolve clashes and snagging or punch lists. ProjectWise provides managed connectivity to the latest project documentation, with review and redlining capabilities for field workers. The Common Project Environment includes a Common Deliverables capability which allows project participants to aggregate, publish, and share, for the first time, consistent and combined deliverables across multiple disciplines. ProjectWise Deliverables Management provides an “instant-on” cloud service for the management of transmittals, submittals, and RFIs. ProjectWise Transformation Service manages automated publishing and workflow-driven delivery of i-models and standardised content to project and field workers.

3. **Common Data Environment** – Bentley’s Engineering Content Management Solution embeds technology developed in the Nuclear industry to provide project delivery organisations with a powerful enterprise environment to capture, manage, index, and leverage their intellectual property across all of their projects and proposals. Engineering Content Management maintains the relationships between and any changes to information it manages, whether structured or unstructured, incarnated in models, documents, or database records. Additionally, user organisations can support field, site, and other round-trip data capture workflows through user-created, managed forms embeddable in applications.
4. **Common Performance Environment** – Asset Performance Management, Reliability Centred Maintenance, Linear Asset Management capabilities and Project Performance Dashboards provide insightful analytics, reporting, and accounting to improve visibility into the progress and status of project delivery as well as operational asset management. Early access to the intelligence created and managed in the first three common environments delivers more efficient operational asset management.

1.1.2 Optioneering and Optimisation

Site Optimisation technology (SiteOps) is a new capability that allows civil engineers, architects, landscape architects and land developers to evaluate more information in the early stages of a project, design more efficiently and minimise site development costs. Revolutionary technology for land development, combining evolutionary computation, cloud computing, generative design and operations research, optimisation uses an array of powerful servers, capable of handling highly complex algorithmic functions to consider thousands to millions of combinations of layout, grading, piping and other options for a site.

The generative design capabilities in Site optimisation technologies can solve incredibly complex engineering queries, comparing millions of layout, grading and piping combinations for a site within

hours. Revisions are easy: adjust a building's location and the software automatically redraws parking, driveways, islands, grading, storm water piping and more.

Cost Optimization – Site optimisation provides incredible time and cost savings while reducing project risk for site planning and land design. It identifies improved layout solutions and grading savings on sites from a single-acre retail parcel up to larger projects such as distribution centres, transportation, shopping centres, schools, industrial projects and mixed use projects.

Site optimisation gives engineers the ability to produce conceptual site designs faster, and to be able to present more options to the client or community.

1.1.3 3D Reality Mesh Models

One of the latest breakthroughs in engineering and maintenance technology is 3D reality mesh models, created by taking photos from a digital camera mounted on a plane, helicopter, drone or even just a smart phone on the ground – quickly rendering as-is 3D asset information models.

Unlike Lidar and Point Cloud solutions where the data collected is large, difficult to manage, intractable and dumb, the result from low cost photogrammetry is a compact, intelligent representation of the asset in its current operating context. This new capability increases the probability that in the very near future there will be a drone in every major infrastructure delivery and maintenance organisation. Using unmanned aerial vehicles (UAV) and normal digital photography, inspectors can quickly, accurately and cost effectively observe existing conditions, then track and trend the condition over time with the ability to compare to the design basis against any previously captured point in its life.

Many existing assets have no information model, no accurate records, possibly some unreliable or outdated 2D drawings. Existing owners or maintainers with poor engineering records, can now capture a precise 3D model using simple digital photographs taken from unmanned aerial vehicles using software like Acute 3D to render an information model that you can maintain going forward – reality modelling.

You can then take updated photos to observe current state and compare them to the model as time goes on. To model a given asset, the image acquisition process requires a minimum of three sharp overlapping photographs. Anyone following this rule will be able to capture suitable imagery datasets, whether using a smartphone, compact DSLR, or a high-resolution professional camera like those used for airborne acquisition.

Once these 3D models are created, they can be used to improve the construction of new facilities as well as in ongoing operations. Recurring 3D reconstruction will support inspection processes, and will allow engineers and designers to work on a 3D model that is always up to date for their enhancement or maintenance plans.

From structural integrity issues on bridges and roads, to wind turbine blades, rig inspections, pipeline monitoring for wall thickness, welds, corrosion and other structural integrity issues, unmanned aerial vehicles with mounted cameras can now help maintenance to more easily and cost-effectively observe these out-of-reach conditions.

Smart3DCapture® applications

Smart3DCapture® applies to a variety of application areas where it dramatically enhances productivity or even opens new business opportunities.



Image courtesy of InterAtlas

3D Cartography

- 1 geographic portals
- 2 topographic databases

Smart3DCapture® is becoming the standard solution for city-scale 3D mapping. It has already been chosen by leading mapping and surveying professionals to generate high resolution photorealistic 3D models of Paris, Tokyo, Melbourne, Stockholm... but also smaller urban areas. [Read our case study on city-scale 3D mapping](#).

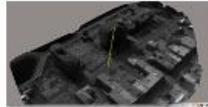


Image courtesy of Idaro Altranje

Architecture, engineering & construction

- 1 land and urban surveying and planning
- 2 as-built 3D modeling
- 3 construction site monitoring

Without any human intervention and within hours, Smart3DCapture® can generate an accurately georeferenced photorealistic 3D model of the neighborhood of a construction project or of an active construction site, thus providing an important tool for impact assessment, decision-making, or project monitoring.



Defense, intelligence & homeland security

- 1 tactical decision-making
- 2 mission rehearsal
- 3 training & simulation

Knowing the terrain is a key asset when time comes to deploy troops for homeland security, natural disasters or war operations. Using photos and videos from various sensors and platforms, Smart3DCapture® allows experts and operational troops to be better prepared and to take better decisions, thanks to quickly yet accurately reconstructed 3D models of the natural and man-made environment.



Image courtesy of VistaWorks

Media, entertainment & e-commerce

- 1 video games & visual effects production
- 2 3D avatars creation
- 3 3D catalogs

Video games and visual effects demand more and more realistic 3D models, for which traditional 3D modeling techniques involve prohibitive cost and time. Smart3DCapture® can automatically turn simultaneous shots of an object or of a character's face or body to an accurate 3D model than can easily be integrated into the 3D editing and rendering workflow. Smart3DCapture® also allows to make 3D modeling available to millions of consumers, through automatic [cloud-based applications](#).



Image courtesy of Technize

Manufacturing

- 1 reverse engineering
- 2 rapid prototyping
- 3 3D printing

Smart3DCapture® constitutes a cheaper, more flexible and hence more generalizable alternative to laser scanning for reverse-engineering and rapid prototyping, since it requires a simple camera for acquisition instead of an expensive special device. Smart3DCapture® can not only produce a dense point cloud that has to be processed/analyzed with some dedicated software, but also a textured 3D mesh, much more amenable to display, editing or 3D printing.



Resources & energy

- 1 mining & quarry operations
- 2 pipeline surveying
- 3 oil & gas exploration

The high resolution 3D models produced by Smart3DCapture® allow to accurately estimate volumes of excavation for open-pit mines and quarries, or to detect changes or anomalies in the vicinity of pipelines. Thanks to the low acquisition costs allowed by unmanned aerial vehicles, a 3D model can be produced on a regular basis to participate in a 4D (3D + time) analysis. Smart3DCapture® also allows to capture geological outcrops from simple photographs, and analyze them from an oil and gas exploration perspective.



Image courtesy of an-atto

Cultural heritage

- 1 art
- 2 archaeology

Smart3DCapture® is able to capture the finest details of buildings, sculptures, bas-reliefs, archaeological sites and excavations, from simple photographs taken on the field by non-expert operators, without any special device. This allows to extend the use of 3D digitization far beyond the current applicability of laser scanning, with the same benefits in terms of preservation, analysis, education and communication. [Read our case study on cultural heritage digitization](#).



Scientific analysis

- 1 geology
- 2 forensics

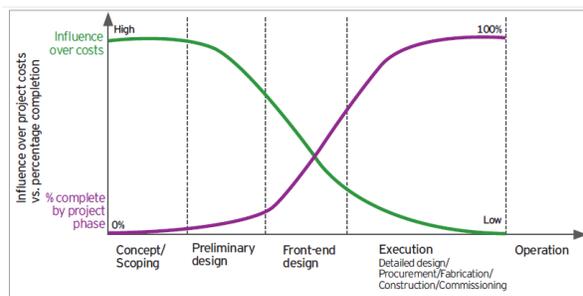
Allowing to accurately capture the tip of a volcano or a crime scene from a few photographs, Smart3DCapture® is a valuable tool for geologists and criminologists.

1.2 Identify the new capabilities smart ICT will provide;

The intelligent application of Smart ICT via a common environment framework outlined in 1.1 has endless capabilities, but fundamentally Smart ICT addresses four key business areas that if achieved would demonstrate better fiscal responsibility and create better conditions for infrastructure investment.

Reduces Risk - It reduces the risks associated with the delivery of complex infrastructure projects through building in the virtual world first allowing clashes to be fixed in the low cost computer world rather than the high cost physical world. Crossrail in the UK removed \$16 Million from the risk register on one station through the application of a common modelling environment and digital engineering.

Reduces Costs - Reduces the costs by managing change and configuration throughout the life of the infrastructure ensuring everyone is working with valid approved information.



Source: Ernst & Young analysis

Increases performance – Having all information available to the relevant stakeholders early ensures that the infrastructure delivered achieves and maintains its expected service levels optimally. This is only possible by ensuring that the relationships between different information sources are created and then maintained.

Business Intelligence - Provides analytical and decision support to managers, enabling better capital and operational expenditure decisions.

1.3 Examine the productivity benefits of smart ICT;

Research* shows that civil construction projects across five continents and spanning 30 years have, on average, cost blow outs of:

- Rail = 44.7%
- Bridge & Tunnels = 33.8%
- Roads = 20.4%

*Policy and Planning for Large Infrastructure Projects: Problems, Causes, Cures. World Bank Policy Research Working Paper 3781

By applying best practice policy, process, standards and ICT Australia could reduce its cost of delivering infrastructure by between 15% and 40% enabling the infrastructure investment gap to be closed more quickly than purely investing additional funding across the current inefficient project delivery capabilities.

Once established across Federal and State projects, by investing in and providing the same technology capabilities via a cloud platform, on a pay per use basis, even the smallest councils in Australia could access and benefit from these innovations. Further increasing efficiency savings.

1.4 Investigate harmonising data formats and creating nationally consistent arrangements for data storage and access;

The process involved in collecting, converting and loading inconsistent data from multiple sources into a central repository can be an expensive task. Moving towards a consistent format, where appropriate, has obvious potential for cost, time and quality savings.

In 2008 the Crossrail project in the UK made a decision to mandate a single File format for all information in order to enable a consistent arrangement for data storage and access on what is the largest Civil construction project in Europe (\$60 Billion). This approach did not rely on a national mandate, was project specific and has resulted in significant efficiencies. The recent UK National Audit Office report shows Crossrail four years in is \$2.2 Billion under the original budget and 1.6% (two weeks) behind schedule with the greatest risk identified being that the rolling stock may not be ready.

The Crossrail approach, pre the UK BIM Mandate highlights that there is nothing to stop Infrastructure owners in Australia immediately adopting a more structured approach to project delivery. By taking this approach, immediate efficiencies and value could be achieved almost immediately.

In addition to Crossrail, Highways England has also adopted a similar approach to efficient Asset Management through the application of Asset Lifecycle Information Management and standardisation.

Highways England.

England's network of 36,000 lane kilometres of motorways and trunk roads is a key component in the strategic transport network, heavily used for business and leisure travel and for the transport of freight. In 2007, it supported 138 billion vehicle kilometres of travel, around 31 per cent of total road travel. Maintaining it effectively and efficiently in a safe and serviceable condition is essential. The Highways Agency's Network Operations Directorate maintains this network, spending £1Bn.

Maintenance work is largely carried out through Managing Agent Contractor (MAC) contracts, in each of the Agency's 14 geographic Areas, whereby a single contractor is responsible for the design and delivery of maintenance work over four or five years with the option to extend up to seven years.

The Highways Agency recognised the need to improve its performance as steward of its key asset, England's strategic road network, by merging operational and management information systems and services that use information or data about the asset. The Highways England success hinged on both its and its supply chain's ability to share a single system to store inventory, condition, works management, and defect management data. This common data should be used by everyone to measure performance in an accurate and consistent way. This large service is delivered, managed and maintained through a Managed Service. Bentley is working in close partnership with HE to replace 17 legacy systems into a single, harmonised asset management information system.

Highways England is using the system to implement rigorous asset management practices to support decisions on maintaining, enhancing, and operating the network more cost effectively. Ultimately, the system will help the Highways Agency achieve its economic impact goal of an estimated \$3.2 billion a year by preventing delay and improving travel along the network.

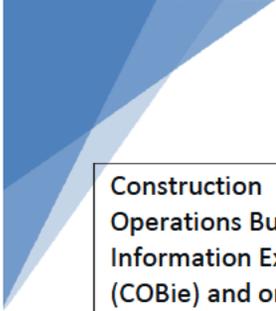
BIM Harmonisation

Some interested parties have called for the government to mandate BIM as a method of achieving tangible benefits relating to the delivery of capital projects. Bentley Systems would argue that the mandating of BIM in the 3D modelling sense is not sensible and mandating standards in an environment where technological advancements significantly outpace the ability for governments to legislate may inhibit achieving the desired outcomes. That is not to say that the government is not important in facilitating the desired outcomes, quite the opposite. The broader benefits of Smart ICT and / or BIM in our opinion will not be achieved in a reasonable timeframe without the government infrastructure owners acting as the driving force for change and we encourage them to focus on the standards regarding the collection, federation and validation of information across the whole asset lifecycle.

By focusing on whole of life information management, infrastructure owners would be able to mandate measurable outcomes. These should be based on relevant core standards, allowing the project delivery partners to use their subject matter expertise, based on the latest best practice processes to work out the best way to achieve the specified outcomes.

There are standards that are relatively mature such as BS 1192 – 2007, ISO 10007, ISO 55000 and which could be, and indeed are being investigated and adopted in Australia. The list of all potential standards is too long to be included in this submission and are constantly changing which is another reason why we would recommend any standards selected are chosen by the relevant infrastructure owner, are project / discipline specific and are outcomes based.

*<http://www.buildingsmart-tech.org/specifications/ifc-overview>



Construction Operations Building Information Exchange (COBie) and or Industry Foundation Class (IFC) or ISO16739* are often suggested as a silver bullet or information interoperability across the lifecycle of building. Neither COBie nor IFC, in their current form, are fit for purpose for civil infrastructure so we recommend that care be taken in ensuring that if standards, formats and processes are to be mandated that they are fit for purpose, industry supported and non-restrictive.

1.5 Identify international best practice in the use of smart ICT in the design and planning of infrastructure;

Rather than reinvent the wheel on this we would recommend the adoption of the investment made by the UK government in addressing the inefficiencies in delivering the built environment. A report in 2009 by Andrew Wolstenholme, then MD of Balfour Beattie and currently CEO of Crossrail, I believe reflects much of the current situation in Australia.

http://constructingexcellence.org.uk/wp-content/uploads/2014/12/Wolstenholme_Report_Oct_20091.pdf

Regarding best practice, it is difficult to go beyond the UK's adoption of BIM. Developed originally for vertical buildings, many elements of BIM are appropriate and relevant to Civil infrastructure, however we do warn about limiting the consideration of BIM to just the design and planning phase of a project. Undertaking the design build without ensuring that the value created during those phases is able to be repurposed during construction and more importantly handed over to the operator and maintainer severely restricts the return on investment.

Crossrail in the UK is recognised by many as the world's leading application of collaborative BIM, as referenced by Consult Australia in the Committees previous report where analysis of wider economic

benefits increased estimates of the benefit-cost ratio from 1.87 to between 2.73 and 3.05. The wider impacts were estimated as an increase in GDP of up to £50bn in 2010 prices.

There is a huge appetite in Australia for BIM however in order to achieve a mature application of BIM it is necessary to have a mature understanding of BIM. There are still many who view BIM as a Product. In fact it is referred to as a product in your committee's previous report. Whilst software companies do offer products that support different levels of BIM maturity, the concept that an organisation can achieve anything beyond a basic degree of BIM maturity solely through the application of a software product is misguided. BIM beyond level 1 can only be achieved through the application of new processes supported by people willing to adapt to those changes and enabled the use of the underlying ICT.

We would refer the committee to the Crossrail project as a template for the mature application of Collaborative BIM

<http://www.crossrail.co.uk/benefits/design-innovation/>

1.6 Consider the use of smart ICT in related fields, such as disaster planning and remediation;

TBC – Due to time limitations we have not addressed this ToR however if permitted we would like to offer information relating to this area.

1.7 Consider means, including legislative and administrative action, by which government can promote this technology to increase economic productivity.

The current Australian Government has indicated that it intends to spend heavily on infrastructure projects in coming years, and the industry as a whole can look to the UK's experiences relating to Building Information Modelling (BIM) to deliver projects on time, on budget and to a set of standards that facilitate more effective maintenance and operations beyond design and construction.

With the construction industry in Australia discussing BIM as an opportunity to increase efficiency, some are calling for the mandating of BIM to drive change. While mandates have helped the UK government save taxpayers \$1.8 billion in construction costs in 2013-2014, it's possible to argue that in Australia, it is more critical that infrastructure bodies and government adopt an outcomes-focused approach. The primary drawback of mandating a specific set of policies and processes for use in BIM is that requirements vary significantly between infrastructure disciplines and technology changes rapidly. What may be cutting edge in terms of design and project development process and tools today may well be obsolete in 18 months. Being wedded to a prescriptive delivery method can actually decelerate innovation as there's reduced opportunity for service providers to bolster efficiency or productivity by developing creative solutions as part of their contract delivery which could further cut down on time and expense.

Aside from stymying innovation, the second issue with mandating "one size fits all" standards across the industry is around managing compliance. Policing compliance to a specific standard ends up costly for government agencies or infrastructure bodies and adds a level of management and monitoring overhead that must in turn be funded by the infrastructure owners. In the case of public infrastructure projects, the cost is generally drawn from consolidated tax revenue. This strain on the public purse can be significant, and unnecessary.

Instead of mandating the use of BIM, government and infrastructure owners could push towards mandating BIM outcomes to maximise value over the longer term.

Infrastructure owners should be encouraged to shift from taking an Opex (operating cost) and Capex (capital expenditure) model towards a more holistic Totex (total expenditure) approach. The bulk of expenditure for most civil infrastructure assets doesn't come during the design and build phase, but

rather during its total lifespan as operations and maintenance costs mount over time. In fact, as much as 95 per cent of an asset's Totex costs over its lifetime are comprised of Opex.

With this in mind, it's critical that infrastructure owners ensure as much information as possible remains usable throughout the lifecycle of a project; from design, through to construction and into operations.

Infrastructure owners who shift their thinking, plan ahead and start projects on the basis of capturing information that can be used to drive down the operational costs will reap the rewards. This is really where the true value of BIM is realised. It's critical for infrastructure owners (Employers) to scope out detailed Employers' Information Requirements (EIRs) at the commencement of a project to ensure that models and other information developed maintain their value.

Today the development of infrastructure projects frequently relies on multiple contractors, all using their own preferred tools, standards and formats to meet their contractual deliverables. Unfortunately the choices made by the contractors, whilst cost effectively enabling them to meet their contractual requirements, often end up costing the owner somewhere during the asset lifecycle when there is a conflict in information compatibility, interoperability or accuracy. So an owner can and should reduce cost and risk by standardising where possible on acceptable data formats and agreeing on how data is to be stored, maintained and shared between stakeholders during the different asset phases. This should form part of the Employers Information Requirements across design, construction, operations and maintenance and is essential to ensure that the return on investment is maximised throughout the asset lifecycle.

This is an areas where government could for example insist that

- Government project delivery teams are required to create and specify their Information Requirements for each project.
- There is a common data environment established where this information can be stored and managed for the life of the Asset
- That the information be provided in a format relevant to the specific project (Road, Rail Bridge, Building etc) and that the data format delivered is both forward and backward compatible to enable reuse throughout the asset lifecycle

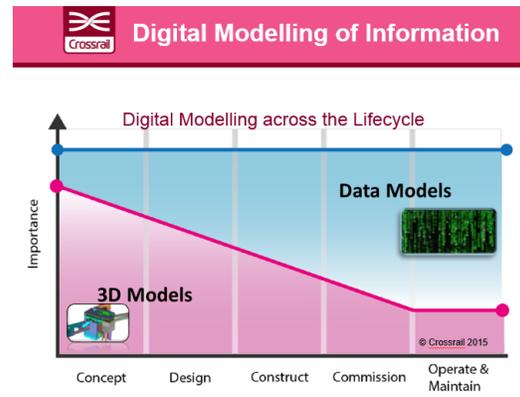
Shifting the focus from the immediate capital expenditure for projects to more of a Totex view will help drive necessary change in the way that public funds are maximised.

The UK Government is currently achieving 20% savings** on the Capex phase of their capital projects and is now aiming for a 33% reduction in Totex.

In Australia, matching the 20% in Capex savings that are already being realised in the UK, means that dollars earmarked for infrastructure projects can be stretched further to deliver more for taxpayer dollars. What this means in plain English is that for every four kilometres of built road or rail track laid, a fifth is free or for every four hospitals that are constructed, a fifth can be provided within the current budget.

** Digital Built Britain www.digital-built-britain.com

Despite the huge appetite for the application of BIM, the Maturity levels in Australia are still very low with the market being informed in the main by organisations with very limited practical experience in the delivery of BIM beyond level 1 (3D Modelling) The Crossrail slide clearly shows that BIM is not all about CAD



3. Summary

Australia does not need to reinvent the wheel or take an extended period to achieve the Committee's objectives. Policies, processes, standards and mature enabling technologies already exist and are being applied around the world to deliver more efficient Infrastructure projects. These projects are willing to accept study tours and Bentley Systems would be pleased to facilitate introductions to organisations currently implementing best practice in Infrastructure project delivery and asset management.

We would welcome the opportunity to explain to the committee how Australia could be delivering projects 20% more efficiently than is currently the case whilst simultaneously reducing the operational costs.

Signature:



Printed Name: Brian Middleton

Printed Title: Senior Director