

Public Private Partnerships: Pinnacles and Pitfalls
Swinburne University, Melbourne, 12 May 2015

***Future perspectives:
Improving environmental, social and economic
performance through Integrated Project
Development***

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CEO
Sustainable Built Environment National Research Centre (SBEnc)
Australia**



Our Mission

To be a world-class research and knowledge broker in sustainable infrastructure and building design, construction and management



Program 1 - Greening the Built Environment

Program 2 – People, Processes and Procurement

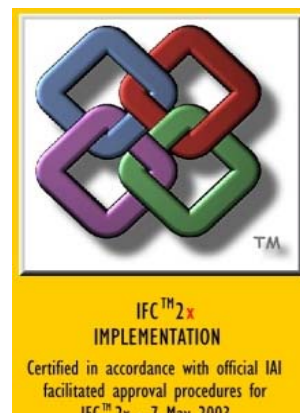
Program 3 - Productivity through Innovation

- » Collaborative research centre with key Australian and international partners
- » Industry, government and research partners
- » Applied research and industry outreach across integrated themes

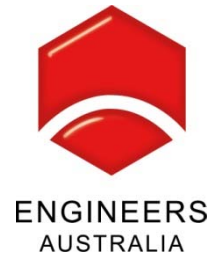
SBEnc Core Partners



Collaborating Partners



Collaborating Partners



**International Council
for Research and Innovation
in Building and Construction**

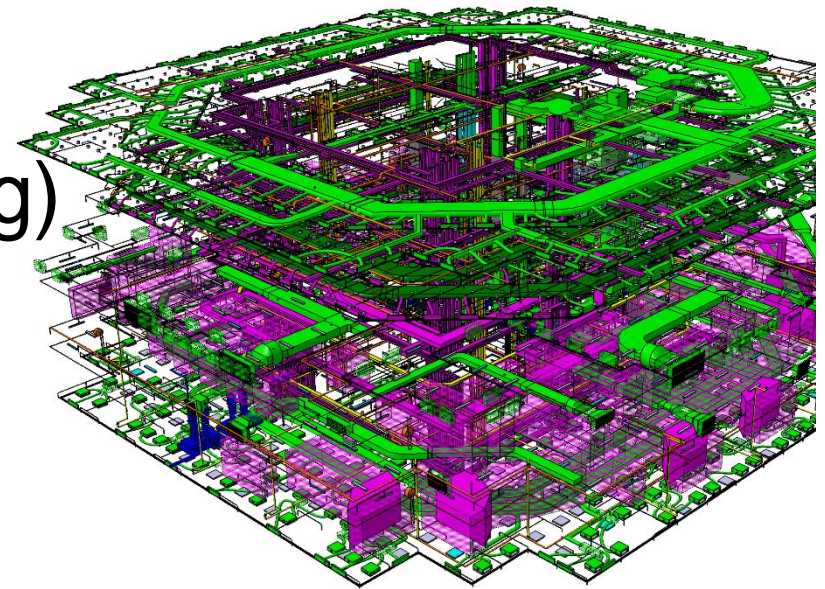
**STANFORD
UNIVERSITY**



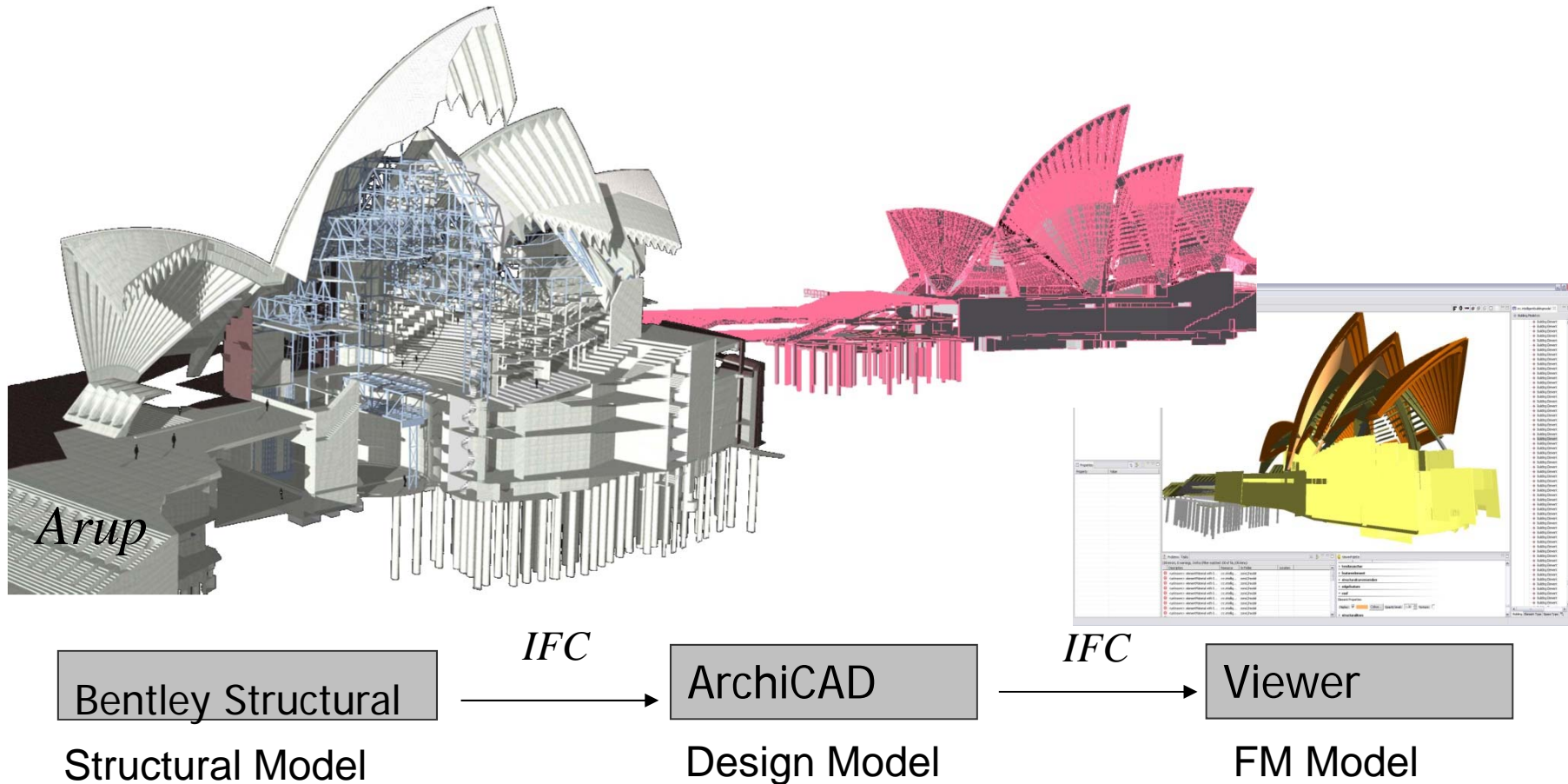


History of Creating Innovative Tools

- International Standards Development
- Automated Bill of Quantities
- Automated Scheduling
- Code Checking
- LCADesign (Eco-profiling)
- Indoor Air Quality
- Sydney Opera House
FM Exemplar project



Reusing Standard Data



Sydney Opera House Implementation

- Adopting BIM for facilities management
- National Guidelines for Digital Modelling
- Exchanging files with consultants
- Vision of a single integrated model
- Vision of a FM interface as a
one-stop-shop



CRC for Construction Innovation National Guidelines Approach

Phase 0 – Briefing/Pre-design

Phase 1 – Conceptual Design

Phase 2 – Schematic Design

Phase 3 – Developed Design

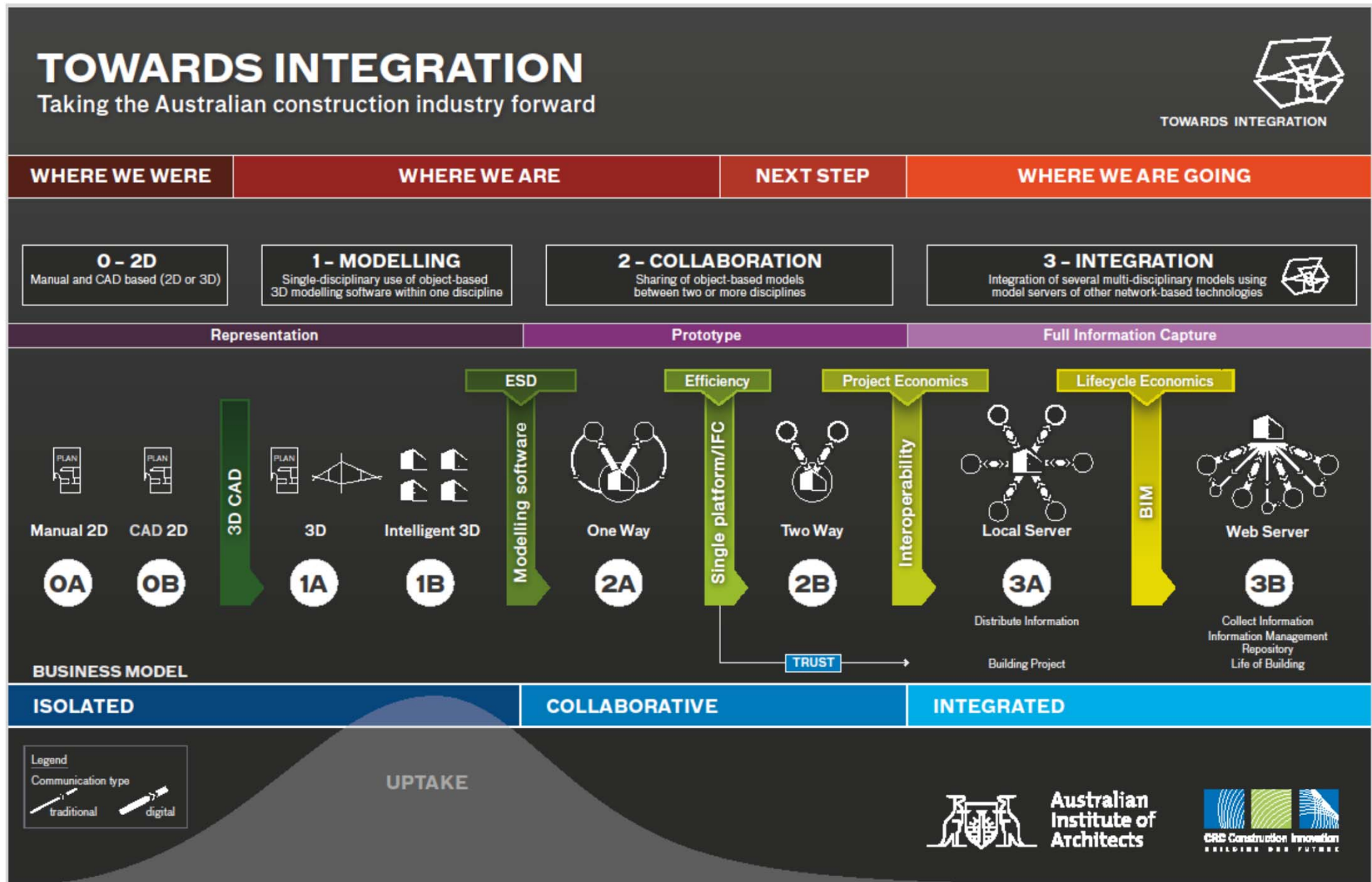
Phase 4 – Contract Documents

Phase 5 – Construction

Phase 6 – Post Construction/FM



Modelling Implementation



Challenges for BIM Implementation

- Disruption vs evolving implementation
- Model users' differing views and expectations of models
- Need for Australian object libraries
- Product information and specification
- Emerging building information classification system
- Information database management
- Management of file sizes
- Sharing information
- Legal, insurance and practice impediments
- Slow industry uptake
- Software to address local requirements

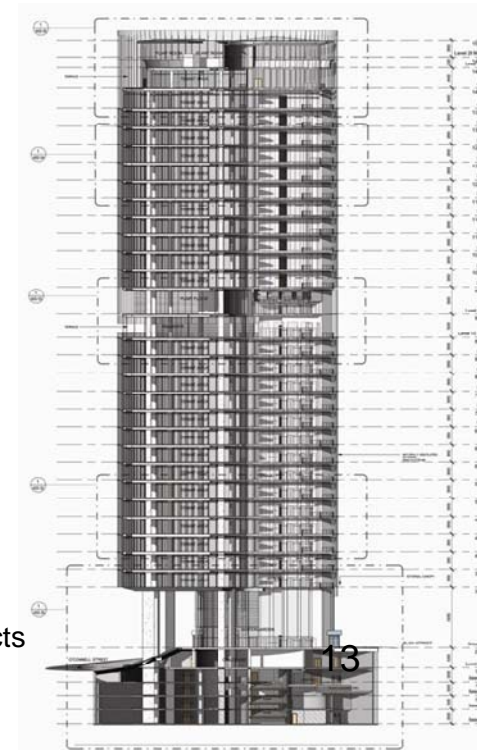
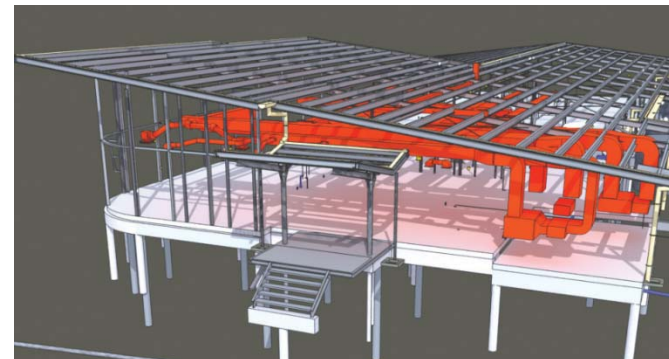


Image Courtesy of Architectus and Ingenhoven Architects

Discipline Modelling, Analysis and Simulation

- Project definition, planning and pre-design
- Architectural modelling
- Structural analysis, design and production models
- MEP analysis, design and production models
- Cost planning and quantity take-off
- Construction models
- Facility management



Case Studies

- North Lakes Police Station, Queensland
- Queensland State Archives Extension Program
- Joint Contact Centre Zillmere, Queensland
- 1 Bligh Street, Sydney
- Brisbane City Hall
- 8 Chifley Square, Sydney



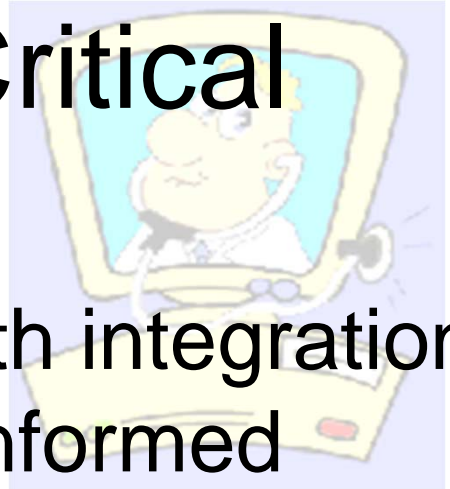
Image courtesy of Arup



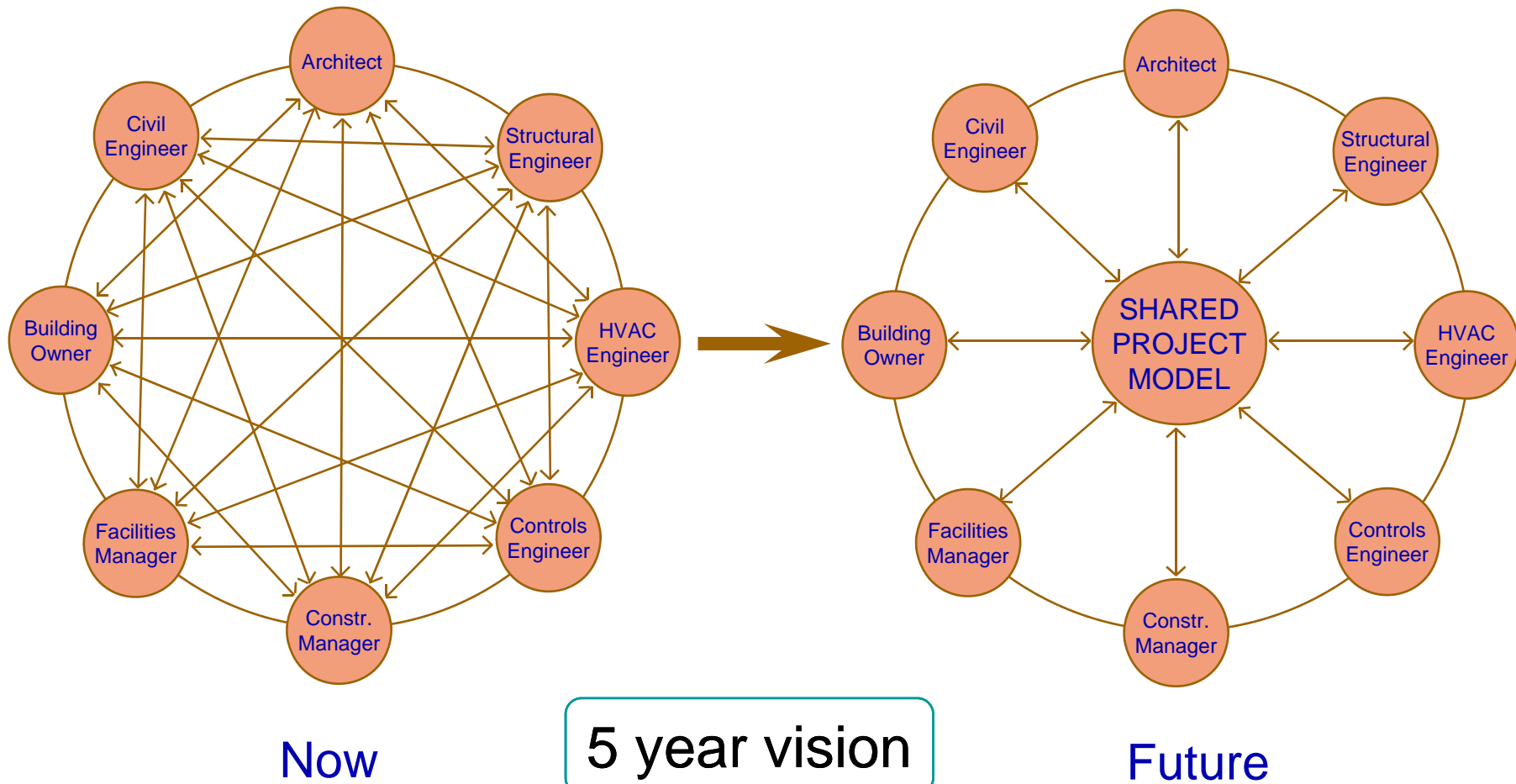
Integration of Data is Critical

Modern business is concerned with integration of business information to make informed business decisions.

The Integrated Data Model must facilitate this.



Shared Project Model



International Alliance for Interoperability
Enabling Interoperability in the AEC/FM Industry



CASE STUDY OF THE ACTON PENINSULA DEVELOPMENT

**Research and Case Study of the Construction of the
National Museum of Australia and the Australian
Institute of Aboriginal and Torres Strait Islander
Studies**

FINAL REPORT

for

**Commonwealth of Australia
Department of Industry, Science and Resources**



**Prepared by
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Dr Selwyn Tucker, Dr Sherif Mohamed, Michael Ambrose,
David Johnston and Dr Keith Hampson.**



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**2001 National Museum of
Australia Challenge:**
Development of
technological and
organisational innovations
based on advanced
collaborative delivery
mechanisms *and* web-based
project management tools

PROCUREMENT STRATEGIES

A Relationship-based Approach

Edited by
Derek Walker & Keith Hampson



Blackwell

2014 Industry Challenge



Sustainable
Built Environment
National Research Centre

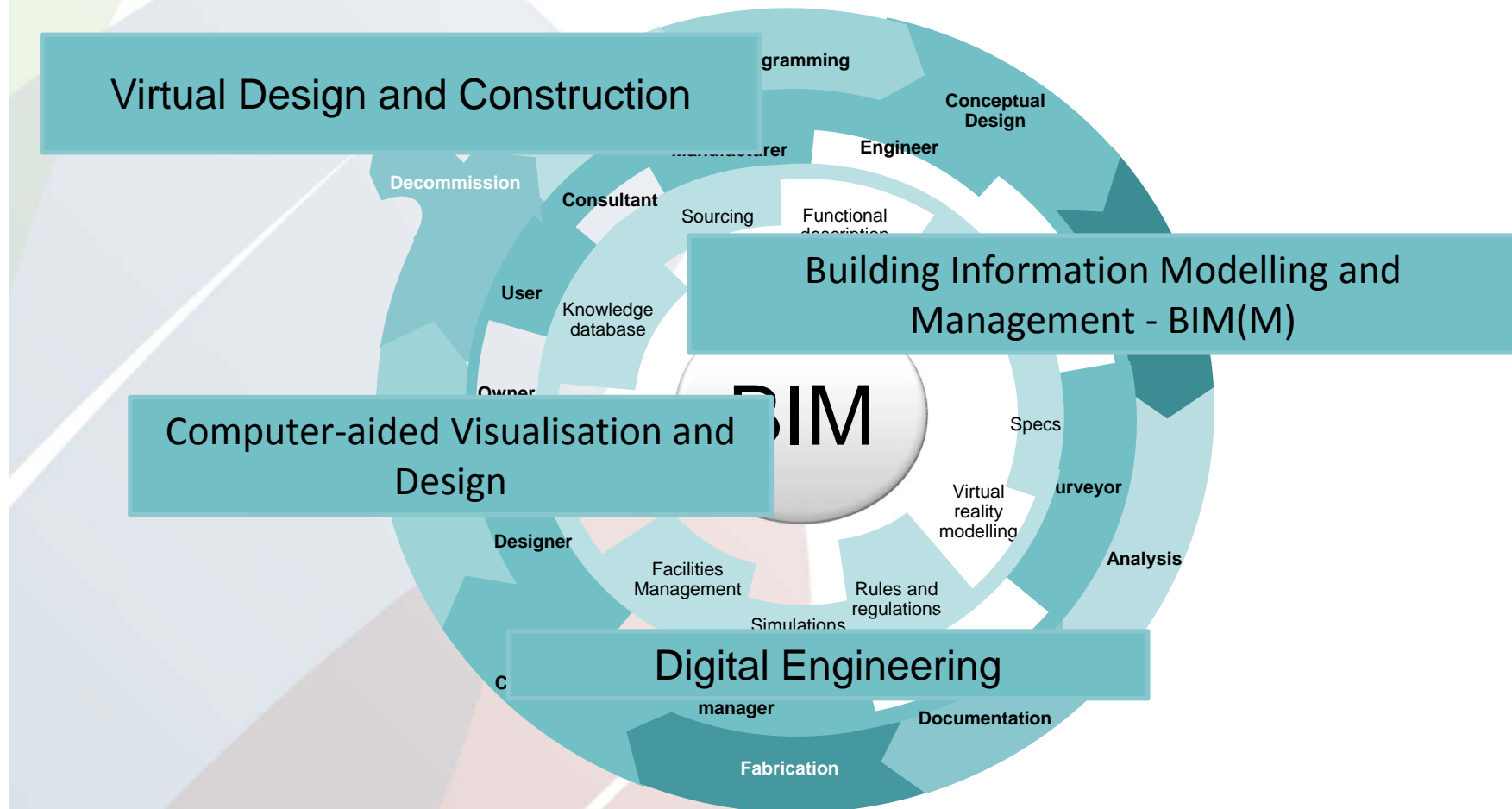
Integrated Project Environments and BIM

- Emerging and transformative
- New set of skills required
- Lack of performance measurement across life-cycle
- Full benefits across whole-of-life and industry still to be achieved



Building Information Modelling

BIM can be defined as a **virtual process** that encompasses all aspects, disciplines, and systems of an asset within a **single virtual model**, allowing all to collaborate **more accurately and efficiently** than using traditional processes.



Integrated project environments

... project delivery models and tools that allow and encourage the integration of teams, processes and information across organisations and construction stages to produce improved outcomes.

SBEnc Research and Collaboration

Research

- Project 2.24 Integrated Project Environments (2013-14)
 - Industry and academia expert interviews
 - Literature and documentation review
- Project 2.34 Driving Whole-of-life Efficiencies through BIM and Procurement
 - Leading national exemplar case studies – design, construction, asset management
 - Literature and documentation review

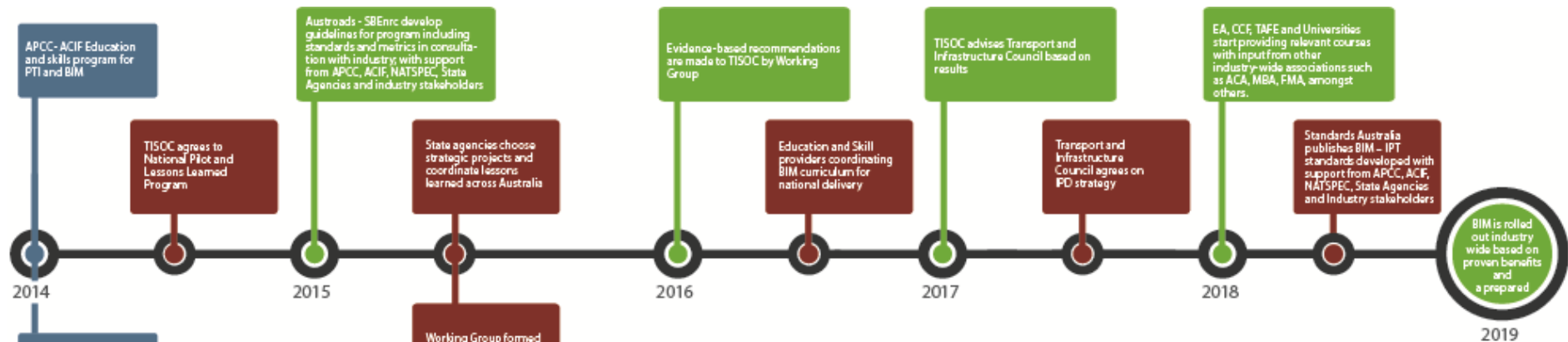


National Strategy

National Pilot and
Lessons Learned
Program

Evidence-based
Recommendations

Industry Standards



Coordinated BIM
Curriculum

Agreement on
National Strategy

New Contractual Frameworks

MODIFY

- **Contracts:** Add clauses that bind addendums to subsequent contracts, reflect authorship and confidentiality and require latest protocol version to be included in model
- **Scope of Works and Technical Criteria:** Add BIM Management Plan (BMP), considering subcontractor contributions
- **D&C Deed Schedule:** Link Levels of Development to model elements in BMP
- **Contract Program/Preliminary Design Report:** Include BIM metrics and success criteria
- **Relationship Management Plan:** Use from ECI
- **Project Verifier:** Maintain independent role while expanding responsibilities to include BIM project coordination and verification (alternative to BIM Project Coordinator)
- **Design Manager:** Expand responsibilities to include BIM coordination between technical disciplines (alternative to BIM Technical Disciplines Coordinator)
- **Tender Selection Criteria:** Expand non-price criteria of BIM enabled projects to include experience, skills and commitment to IPD
- **Bonus Clauses:** Expand benefit sharing clauses and link to clear metrics and success criteria related to project goals
- **ECI Style Workshops:** Use in other contracts
- **Risk Apportioning and Indemnification:** Agree in contract agreement and review language carefully with legal and insurance counsel
- **Skill Development Plan/Enterprise Training Management Plan:** Use to reduce skill gaps
- **Regular Update Meetings:** Address changes to protocol and include all affected parties
- **Systems for Design Development and Data Management:** Select based on project specific considerations such as scale, cost, level of effort needed for new users, and asset management systems
- **Submissions:** Avoid physical copies, request bookmarked PDFs, native format and IFC
- **Final Submission:** Specify asset management and monitoring data only

DOCUMENTATION



ROLES



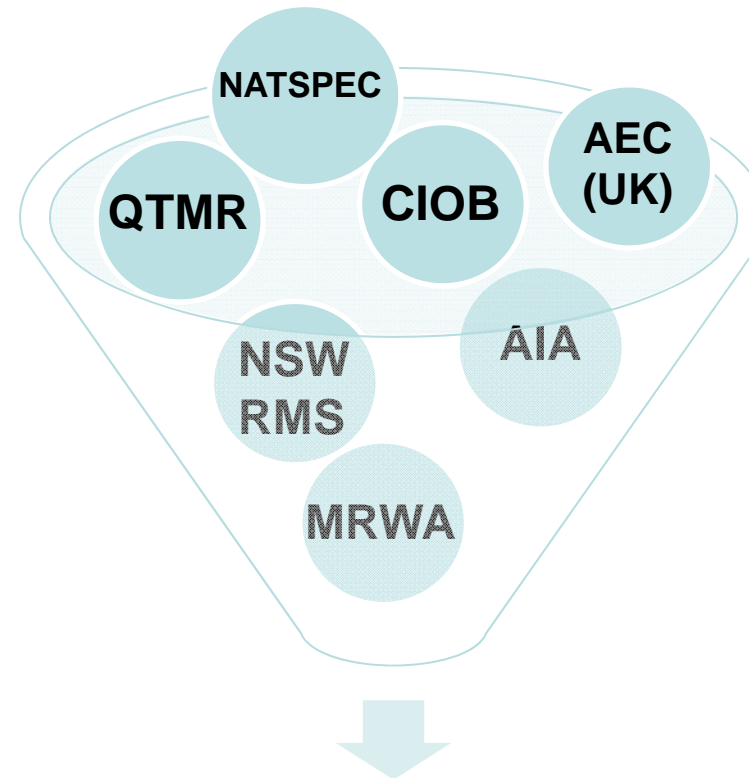
PROCESSES



OUTPUT

NEW

- **BIM Protocol:** Develop at earliest possible project stage as contract addendum, including changes management strategy, methodologies and technologies
- **Data Sharing Protocol (internal and external):** Develop to address confidentiality, data security; user rights and ownership; authorised uses; transmission, use, storage and archiving of data
- **Contractual Clauses:** Binding protocols to avoid compliance issues
- **BIM Project Coordinator:** Independent entity helps to set-up the integrated project approach, audit the model and coordinate contributions to the model and protocol
- **BIM Technical Discipline Coordinator:** Facilitates coordination of technical disciplines for BIM development, training, standards and data requirements; and team "buy-in" for collaborative integrated environment
- **BIM Strategic Coordinator:** Coordinates across projects and hand-offs between phases, manages knowledge transfer
- **Element Ownership and Handing-off Procedures:** Clearly define responsibilities and procedures for evaluating, mitigating and resolving any potential issues found by other users
- **Culture:** Encourage a collaborative, no-blame culture by defining as part of core values, maintaining open communications and apportioning risk adequately
- **Common Data Environments:** Establish to facilitate collaboration and data management; consider using classification system used by AEC (UK) and develop user manuals, including impact on roles of project participants
- **BIM Outcomes (As-built) and Metrics:** Aligned with the overall system requirements of facility and asset managers as well as traditional and BIM specific metrics



Recommendations for Current Contract Practices

Dissemination Strategy

Tier 1

Government
Decision-makers



Target audience

Key politicians
(e.g. Federal and State industry
ministers and departmental
heads); Chief Scientists; Transport
and Infrastructure Council; state
road agencies, and industry
peak bodies such as Austroads,
Roads Australia and Infrastructure
Australia

Mechanisms

- Demonstrate value of
innovation to the industry
and nation through informative
documentation
- Face-to-face representations
from research and industry
leaders

Tier 2

Mid-level Strategic
Decision-makers



Target audience

Government program directors
and industry leaders

Mechanisms

Present case studies of systemic
learning through informative
documentation, short audio-visual
materials, seminars for project
partners agencies; ongoing
formal exchange with industry
associations e.g. NATSPEC, ACIF,
APCC and buildingSMART

Tier 3

Project and
Program Managers



Target audience

Industry professionals; SMEs

Mechanisms

Guideline documents;
professional development
programs; publications in industry
newsletters and journals e.g.
CRC for Construction Innovation
Guide for Best Practice for Safer
Construction, Engineers Australia
News and magazine

Delivery

Development of short courses
with materials provided by lead
industry researchers and delivered
in conjunction with organisations
such as Civil Contractors
Federation, Engineers Australia,
Construction Skills Queensland
as professional development
courses

Recommendations to reduce the skills gap

- ☐ Better coordination
- ☐ Stronger links between
industry and academia
- ☐ Support systems for
capability development

Outcomes



Outcomes

Project 2.34 Driving Whole-of-life Efficiencies through BIM and Procurement

- Leading comparators to assess the value of BIM across the life-cycle of infrastructure and buildings
- Framework to assess the actual benefits of implementing BIM in Australian asset delivery and management
- Benefits from transitioning from 2D asset management systems to 3D integrated digital built environment

Relevant to the Development of National Strategy for IPD Uptake

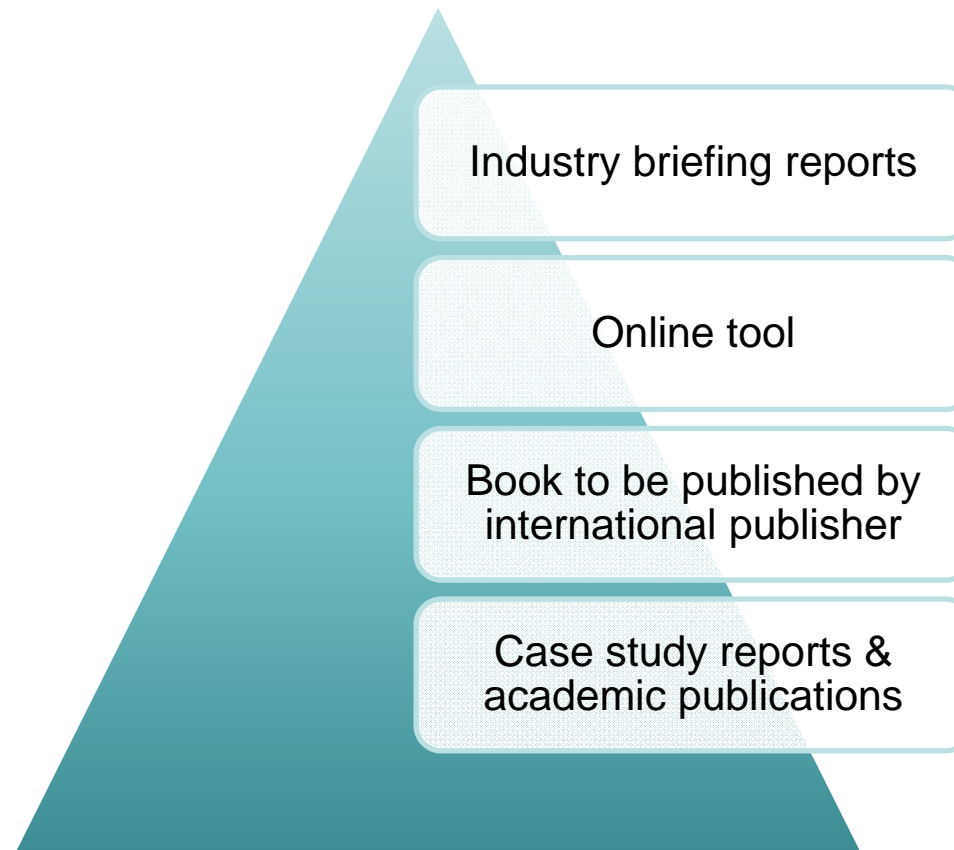
- (i) Lead agent role
- (ii) Client role
- (iii) Mandates
- (iv) Pilot projects
- (v) Metrics
- (vi) Standards

Indicative Benefits

- Improved coordination
- Improved communication
- Improved data management
- More accurate quantity take-off
- More accurate cost accounting
- Better scenario analysis
- Lower operational cost
- Lower construction cost
- Lower design cost
- Better use of supply chain knowledge
- Improved productivity
- Optimisation of construction sequence
- Better programming
- Less rework

Coming soon

Delivering Value with BIM – A Whole-of-life Approach



Coming soon

Delivering Value with BIM – A Whole-of-life Approach

Context

- BIM
- Strategy
- Case studies
- Capabilities
- Other considerations

Framework

- Detailed Methodology
- Step-by-step guide

Dictionaries

- Benefits
- Enablers
- Metrics

Global Collaborations

Leveraging Global Innovation Networks



**International Council
for Research and Innovation
in Building and Construction**

Global network for exchange and cooperation in research and innovation
for the construction industry

Global Collaborations

TG90: Information Integration in Construction (IICON)

- Efficient knowledge creation, preservation and integration across life-cycle of constructed assets
- Monitoring and feedback from end-users into design, construction and asset management of buildings and infrastructure
- Creating more effective and reflective industry and deliver benefits to public and private asset owners



CSTB
le futur en construction



**Sustainable
Built Environment**
National Research Centre



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POLYTECHNIC UNIVERSITY
香港理工大學



서울대학교
SEOUL NATIONAL UNIVERSITY



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