Building BIM in Australia: A Retrospective and Prospective Analysis

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Presentation Structure

1. Background to Australia’s SBEnrc
2. Current BIM/IDDS initiatives
3. Future collaborations and goals
Australia’s Construction Industry

• A$160B = US$160B = €120B pa turnover
• Employs 1 million people
• 250,000 firms many small firms …
• Growing and slowing at same time …
  — Residential, Commercial, Industrial
  — Resources & Mining, Infrastructure
• Slower in productivity growth than others
  – nationally and internationally
• Safety remains an issue
• Strong growth in *green* construction
• Declining public support for R&D as private support grows
To be an enduring world-class research and knowledge broker in sustainable infrastructure and building design, construction and management
Growth of Collaborative Research through Australia’s SBEnrc

QUT/CSIRO Construction Research Alliance
Program 1 - Greening the Built Environment

Program 2 – People, Processes and Procurement

Program 3 - Productivity through Innovation

» A nation-wide collaborative research centre
» Industry, government and research partners
» Applied research and industry outreach across three integrated themes
Core Members

QUT
John Holland
Swinburne University of Technology
Queensland Government, Department of Transport and Main Roads
Queensland Government, Department of Public Works
Queensland Government, Infrastructure and Planning
Transport Roads & Maritime Services
NSW Government
Department of Treasury and Finance
Building Management Works
Office of Strategic Projects
Main Roads Western Australia
Department of Commerce
Parsons Brinckerhoff
Curtin University
Sustainable Built Environment National Research Centre
Collaborating Partners

- Engineers Australia
- Master Builders
- Green Building Council Australia
- City of Townsville
- Sydney Opera House
- VicRoads - Keeping Victorians Connected
- VTT - For Advanced Engineering
- International Council for Research and Innovation in Building and Construction
- Sustainable Built Environment National Research Centre
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<tr>
<td>Research Program 1 will deliver improved environmental performance by the built environment through enhanced ecological efficiencies, including carbon emission reductions and climate change adaptation.</td>
<td>Research Program 2 will deliver improved social outcomes for built environment workers and the Australian community through increased uptake of sustainable practices and minimising...</td>
<td>Research Program 3 will deliver economic, environmental and social benefits to the built environment industry through reductions in risks and costs and improved productivity...</td>
<td>Prior Research Program: CRC for Construction Innovation</td>
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<td>Projects</td>
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<td>- The Future of Roads: The Role of Road Building in Reducing Environmental Pressures and Both Mitigating and Adapting to Climate Change</td>
<td>- Offsite Fabrication and Links to Product and Process Innovation</td>
<td>- Supporting the Facility Lifecycle</td>
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<td>- Harnessing the Potential of Biophilic Urbanism in Australian Cities</td>
<td>- Leveraging R&amp;D for the Australian Built Environment</td>
<td>- Supporting Infrastructure Management by Combining Sensors and Asset Information Models</td>
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SBEnrc = Public-Private Partnership in R&D

• Build innovative networks of industry, government and researchers to deliver applied outcomes
• Attract and mobilize resources globally
• Research skills training for industry
Researchers

We build bridges!
The Three IDDS Imperatives

- Collaborating People
- Integrated Processes
- Interoperable Technologies

To minimise all forms of waste,
whilst delivering greater assured value
for sustainable whole lifecycle outcomes
Australian CRC for Construction Innovation
(2001-2009)

IDDS Projects Timeline

Early Design  Detailed Design  Pre-construction  Construction  Facilities Management

Parametrics For Massing Studies  Design Check  Design Spec  Automated Estimator  Automated Scheduler  Integrated FM

Microclimates  Design View  Design Spec  Design View

Sustainable Built Environment National Research Centre
IDDS models help us improve

• Environmental, Social and Economic Aspects of
  – Where we build
    • Landform modelling under various conditions
  – What we build
    • Options, Scenarios
  – How we build
    • Visualisation, Fabrication, Coordination, Scheduling, Costing
Relate and Compare Performance Data

Space level

System level

Component level

Value

Cost

Intervention

relate

aggregate

compare

Source: Martin Fischer, Stanford University
Life Cycle Assessment

Source: Martin Fischer, Stanford University
“An Exemplar Project”
Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry

Michael P. Gallaher, Alan C. O’Connor, John L. Dettbarn, Jr., and Linda T. Gilday
Modelling the Opera House
1952 to 2008

Physical models (1952 – 1972)

BIM models (2003 - 2008)
1:48 Scale Physical Model made in 1972
All in the one building

- Commenced 1958
- Opened 1973
- Cost $100M
- Value $2bn
- 1,000+ rooms
- 7 performance spaces
- 60 dressing rooms
- 5 restaurants & bars

- 1,500 performances
- 1,000 other events
- 1,100,000 patrons
- 4,500,000 visitors
- $85M business
- $21M FM budget

all in year ...
All faces visible to survey dome will produce a very dense point cloud map.

Generally the laser survey method will be adequate to 1m above finish floor level with conventional survey methods being used to generate the coordinate data.
Comfort and Energy Simulation
FM Energy Monitoring
Integrated information: Energy usage
Integrated information: Fire safety
Industry dissemination
Numerous Awards

Created by Arup / JPW Architects
Stuart Bull - Wayne Dickerson
Animation by Wayne Dickerson Associate JPW
National and international industry awards:
Consult Australia ... Project of the Year
American Institute of Architects - Technology in Practice
Previous CRC for Construction Innovation Work
Looking ahead ...
Business Effects of ICT Innovation

Markets Increased

Functionality Increased

Productivity Increased

Operational Thinking

Tactical Thinking

Strategic Thinking

Automational

Informational

Transformation

Long Lasting Competitive Advantage

Cultural transformation
Need enablers to move forward!
Object Libraries
Open source digital modelling object library

• In Australia approximately 20,000 “design” firms creating their own product libraries
  – Poor efficiency
  – No interoperability
  – No consideration of downstream use

• Product manufacturers need to support multiple tools
  – Want single point of distribution

Provide national consistency across industry
Provide SMEs with a vehicle to adopt and benefit
Project Product Library
Reusable Kit of Parts of Intelligent Parametric Generative Elements Containing PROJECT KNOW
Object Libraries

• Our approach

Shared generic Database Ifc-based

Software transformations

Revit
ArchiCAD
Bentley
...

Direct insertion into software
Object Libraries

Object Library Server

Meta schema

Schema

Objects

Transformations

Manufacturers

software

Object Libraries

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Manufacturers

software
Managing a Portfolio of Buildings

- Queensland Government Assets
  - 1,300 schools, 70 TAFE campuses
  - 200 owned office buildings
    - 1 million m² office space
  - 65,000 units of social housing
  - 14 Correctional Centres
  - 170 Hospitals & Healthcare centres
  - 340 police stations
  - Major cultural buildings
Managing a Portfolio of Buildings

• How do we manage all of these?
• Build an asset register
  – Support strategic planning
  – Characterize by building type
  – Data collection through annual surveys
  – High level modelling of portfolio
Sensors for Infrastructure

• What is the problem?
Sensors for Infrastructure

• What is the problem?
Goodwill Bridge, Brisbane
Sensors for Infrastructure

• What IT structure do we need?

![Diagram showing the relationship between sensors, asset data, user interface, and analysis]

- Sensors
- Data stream
- Flat file
- Spreadsheet

- Asset Mgt System
- User interface
- Analysis
  - Predicted vs Actual

- Asset
- Arup

- Sustainable Built Environment
  - National Research Centre
1. Environmentally sustainable construction
2. Meeting client needs
3. Improved business environment
4. Welfare and improvement of the labour force
5. Advanced information and communication technologies
6. Virtual prototyping for design, manufacture & operation
7. Off-site manufacture
8. Improved construction processes

IDDS is central to our future
the new world

The road is long,
full of adventure, full of knowledge