SBEnrc Project 2.72

Leveraging an Integrated Information Lifecycle Management Framework – Building and Infrastructure Sectors

Final Industry Presentation

9 December 2021

ACKNOWLEDGEMENTS

This research has been developed with support provided by Australia's Sustainable Built Environment National Research Centre (SBEnrc). SBEnrc develops projects informed by industry partner needs, secures national funding, project manages the collaborative research and oversees research into practice initiatives. Core Members of SBEnrc include BGC Australia, Government of Western Australia, Queensland Government, Curtin University, Griffith University, RMIT University and Western Sydney University. This research would not have been possible without the valuable support of our core industry, government and research partners.

Presentation overview

- Introduction to SBEnrc partners and the DE theme
- Research findings
  - Heritage BIM and BIM Competencies – Dr. Emiliya Suprun
  - Data-driven pavement crack monitoring and analysis – Dr. Yongze Song
  - Digital engineering standards and implementation – Dr. Jun Wang
- Moving forward

Partner contribution

Core Partners:

Main Roads Western Australia

Department of Energy and Public Works, Queensland

Department of Communities, Housing and Digital Economy, Queensland

Department of Communities, WA

Project Partners:

Sydney Opera House

Partner contribution

PSG Chair:

Steve Golding AM, RFD

Research Team:

Peng Wu (Curtin University, Project Leader)
Ammar Shemery (Curtin University)
Yongze Song (Curtin University)
Jun Wang (Western Sydney University)
Rodney Stewart (Griffith University)
Emiliya Suprun (Griffith University)
Rebecca Yang (RMIT University)

DE theme in SBEnrc

2017. P2.51. Developing a Cross Sector Digital Asset Information Model Framework for Asset Management

- Determine the effectiveness of existing asset information classification and structuring systems in supporting the practical requirements of asset managers.

2018. P2.64. Unlocking Facility Value through Lifecycle Thinking

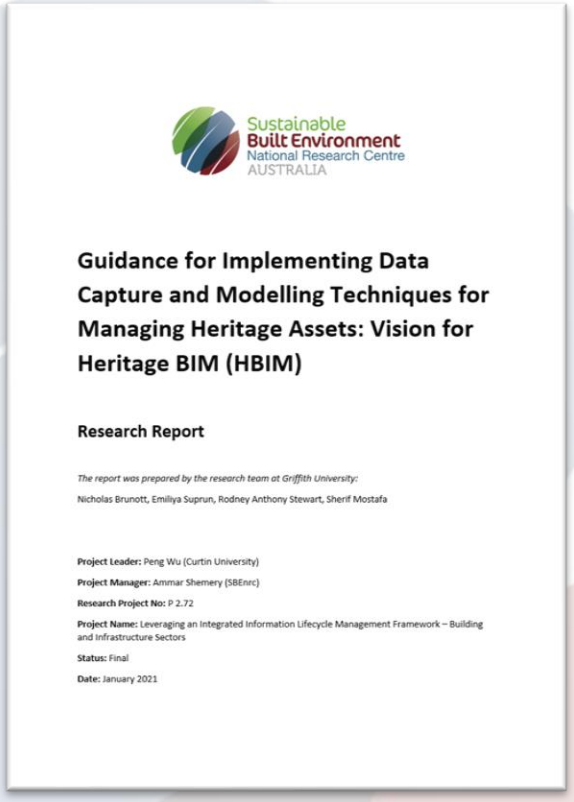
- Demonstrates the value of lifecycle thinking and evidence-based decision making in facility asset management.

2020. P2.72. Leveraging an Integrated Information Lifecycle Management Framework – Building and Infrastructure Sectors

- Industry best practices and international standards related to structured and integrated data.

Heritage BIM and BIM competencies

Department of Energy and Public Works


Sustainable Built Environment National Research Centre AUSTRALIA

Guidance for Implementing Data Capture and Modelling Techniques for Managing Heritage Assets: Vision for Heritage BIM (HBIM)

Research Report

The report was prepared by the research team at Griffith University:

Nicholas Brunott, Emiliya Suprun, Rodney Anthony Stewart, Sherif Mostafa

Project Leader: Peng Wu (Curtin University)

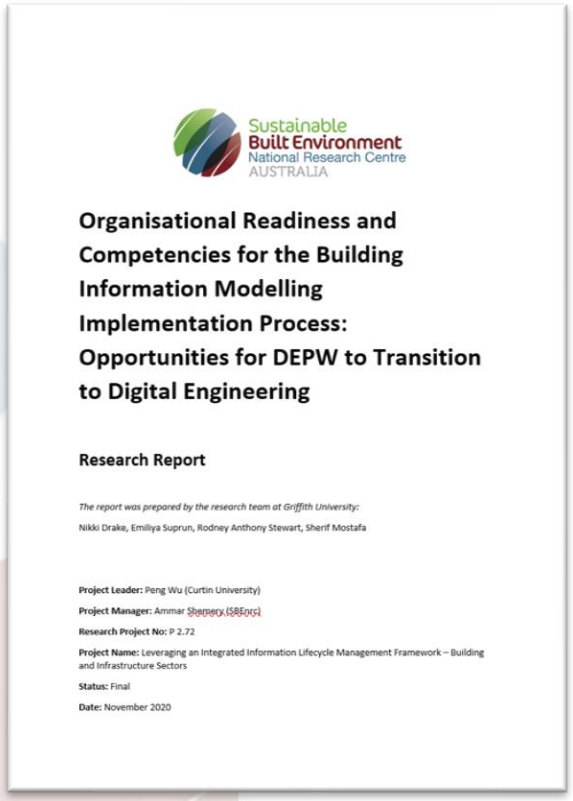
Project Manager: Ammar Shemery (SBEnrc)

Research Project No: P 2.72

Project Name: Leveraging an Integrated Information Lifecycle Management Framework – Building and Infrastructure Sectors

Status: Final

Date: January 2021


Sustainable Built Environment National Research Centre AUSTRALIA

Organisational Readiness and Competencies for the Building Information Modelling Implementation Process: Opportunities for DEPW to Transition to Digital Engineering

Research Report

The report was prepared by the research team at Griffith University:

Nikki Drake, Emiliya Suprun, Rodney Anthony Stewart, Sherif Mostafa

Project Leader: Peng Wu (Curtin University)

Project Manager: Ammar Shemery (SBEnrc)

Research Project No: P 2.72

Project Name: Leveraging an Integrated Information Lifecycle Management Framework – Building and Infrastructure Sectors

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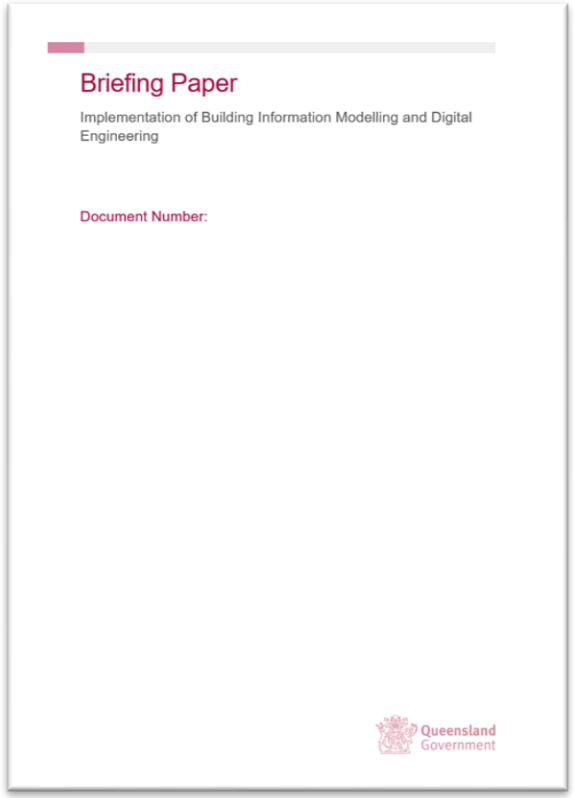
Date: November 2020


Briefing Paper

Implementation of Building Information Modelling and Digital Engineering

Document Number:

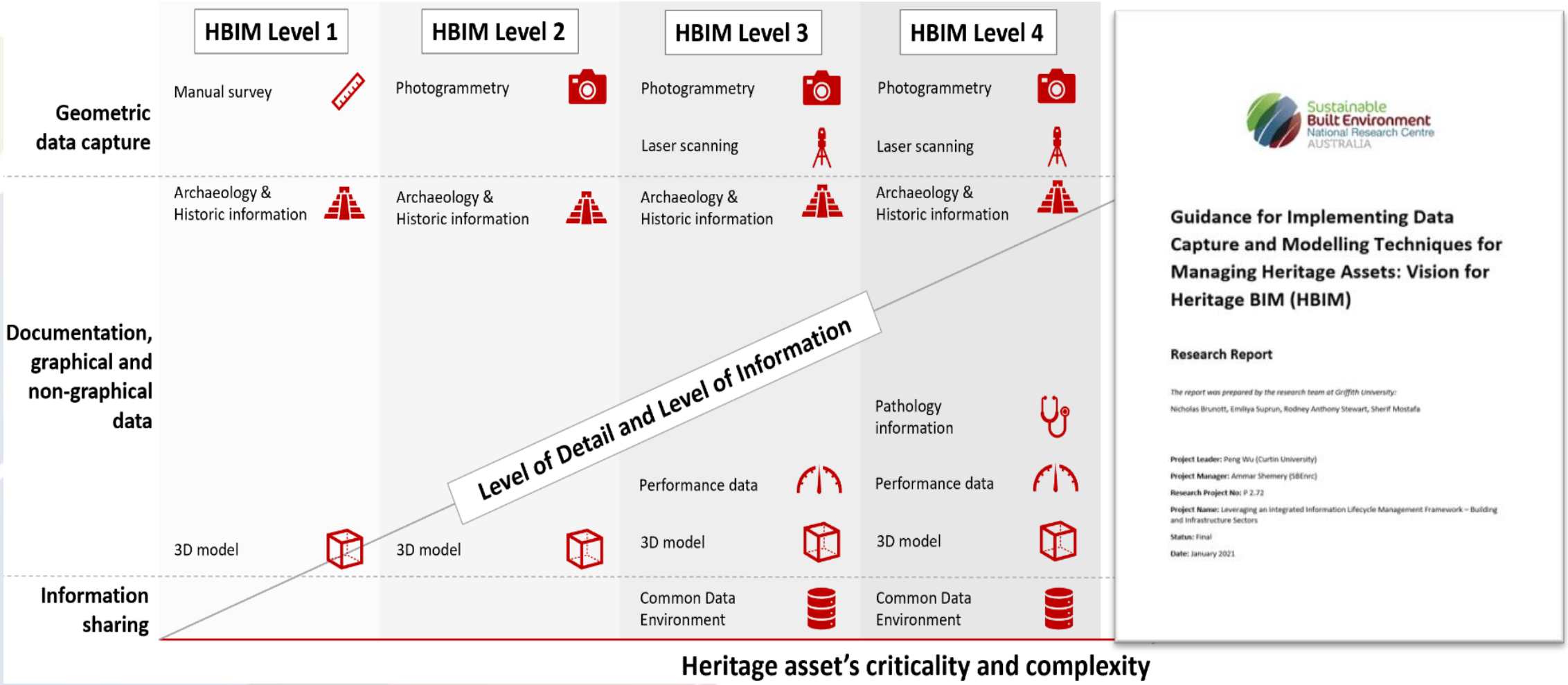
Queensland Government

Queensland Government

Sustainable Built Environment National Research Centre AUSTRALIA

Griffith UNIVERSITY Queensland, Australia

Heritage BIM



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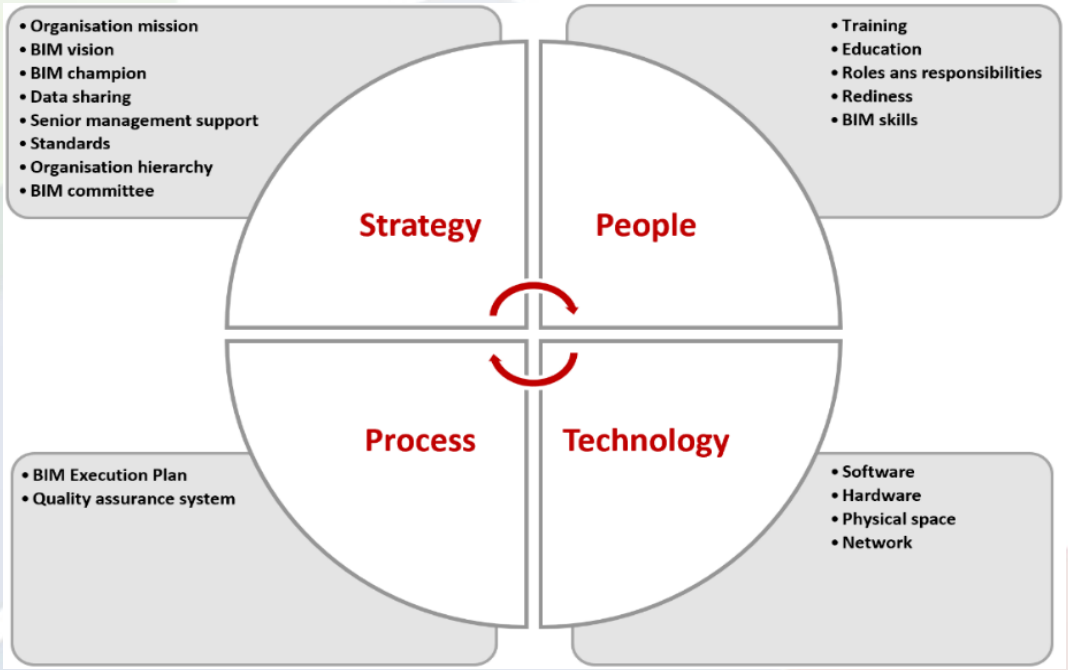
Organizational Readiness and Competencies for the BIM Implementation Process



Data collection

A questionnaire survey with DEPW staff :

1) Background
2) Current practices at DHPW
3) Personal perceptions and awareness of BIM
4) Personal experience with BIM
5) Personal experience with BIM documents
6) Knowledge of international and Australian BIM standards
7) Implementation readiness for BIM – Technology
8) Implementation readiness for BIM – People
9) Implementation readiness for BIM – Process and strategy
10) Personal readiness

Semi-structured interviews with DEPW representatives

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Organizational Readiness and Competencies for the BIM Implementation Process

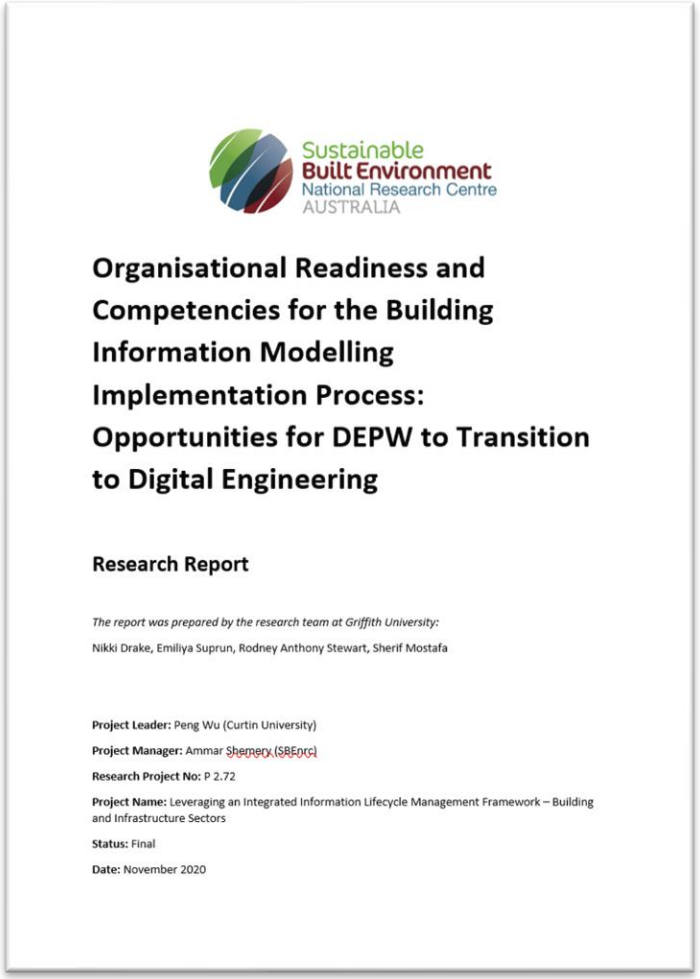
Recommendations based on the research findings:

Leadership
- Leadership team
- BIM champions

Building of BIM knowledge
- Targeted BIM education and awareness activities
- Promotion of relevant BIM standards, guidelines, and frameworks

Development of information requirements documentation
- Establishment of information requirements and information exchange protocols for BIM projects
- Development of information requirements templates

Establishment of asset classification system
- Adoption of a structured and standardised asset classification system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BIM Implementation Documentation

- Briefing Paper: Implementation of Building Information Modelling and Digital Engineering
- Project BIM Brief template
- Supplier BIM Capability Assessment Form template
- Design Project BIM Execution (Management) Plan template
- Construction Project BIM Execution (Management) Plan template
- Master Information Delivery Plan template
- Organisational Information Requirements template
- Asset Information Requirements template
- Exchange (Employer's) Information Requirements template

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Key Lessons Learnt & Critical Success Factors

- **Do not model all data to the *n*th degree**

The organisation has a good understanding of the right LOD-LOI requirements that will add value to business functions

- **Make sure the organisation's information systems are integrated to enable interoperability, simple data flows and data exchange process**

Strategy and requirements must consider all of the organisations' information systems and seamless transfer between them

- **Implement a change management program for the technological improvement opportunity**

Strategy adequately considers people, constraints, organisational structure, etc.

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Key Lessons Learnt & Critical Success Factors

- **Do not try to change everything at once**

Strategy stages transition sensibly and targets best value opportunities first, and measured benefits are used to further enhance buy-in from employees

- **Properly communicate to the entire supply chain regarding what information is needed, when and in what format**

Comprehensive BIM/DE strategy with OIR, AIR, EIR, etc.

- **Sufficiently consider software data compatibility, standards and ownership**

Strategy ensures that new and old systems can talk to each other and that data is owned by the organisation and not a provider

- **Do not allow particular software solution driving the strategic planning of the organisation**

Organisation considers the opportunities, constraints and gaps first and then selects software solutions fitting their strategy

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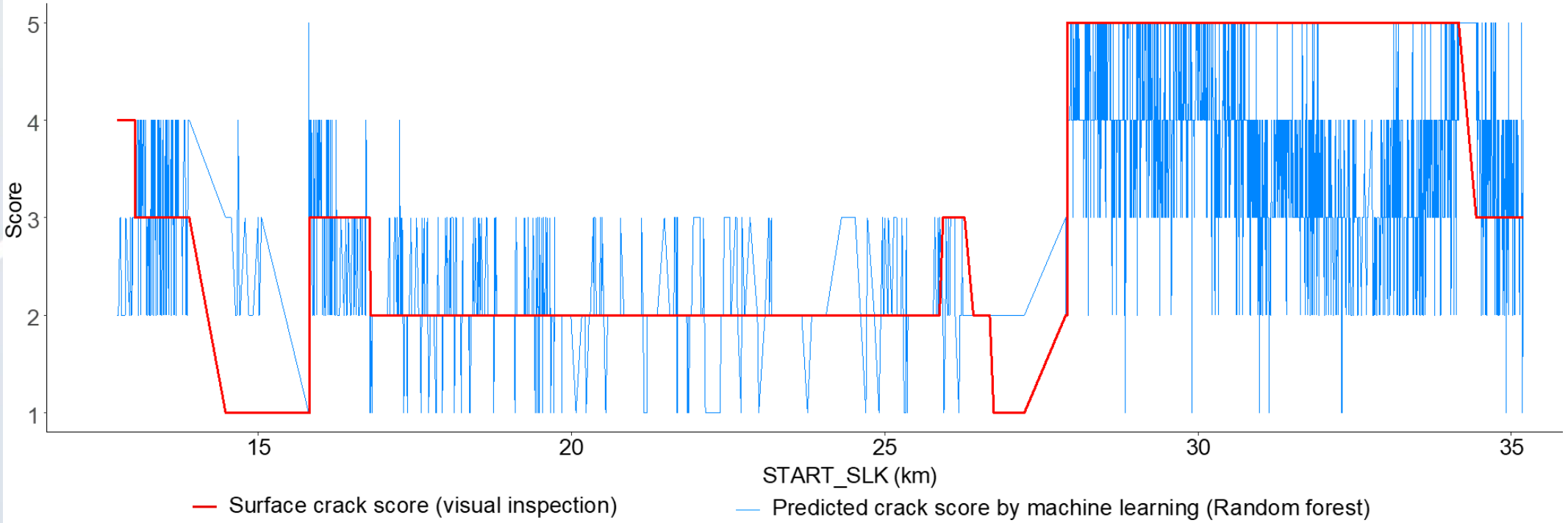
Data-driven pavement crack monitoring and analysis

Prediction results

Example of TOODYAY Road (M026) in Wheatbelt

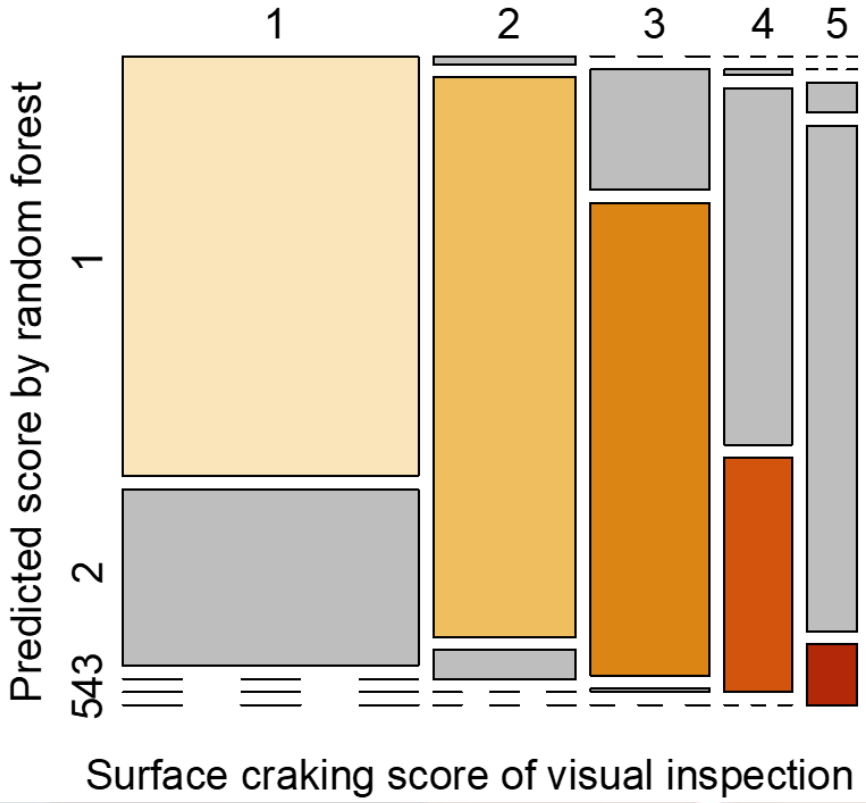
PredictedNewSurfCrack_Wheatbelt.csv



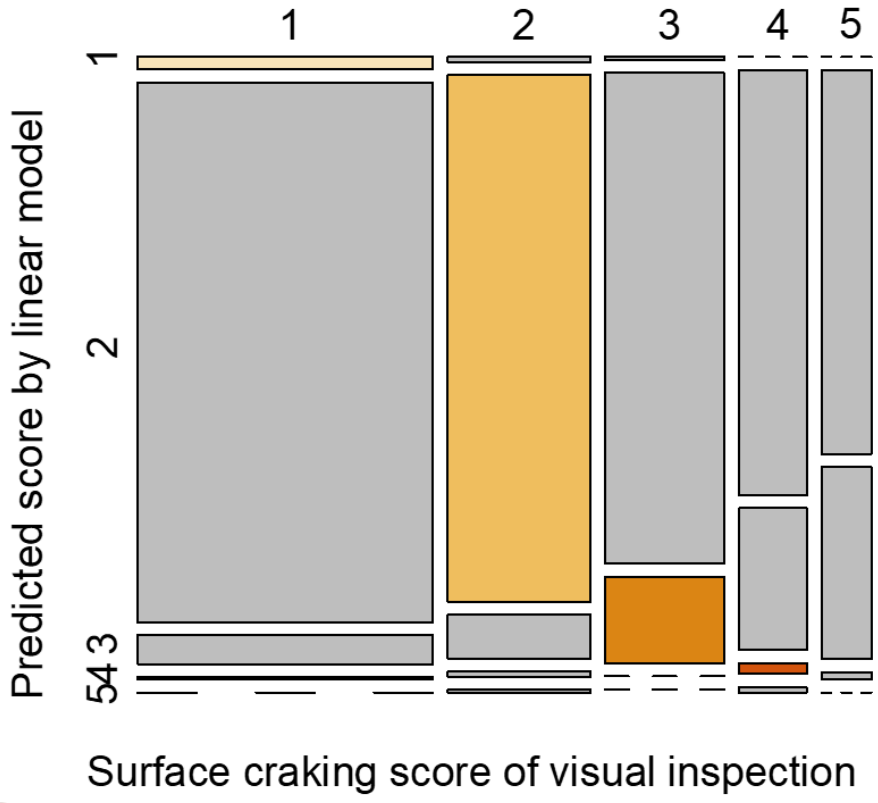
Data-driven pavement crack monitoring and analysis

Results evaluation

Comparison between visual inspections and random forest predictions **(Accuracy = 69.3%)**

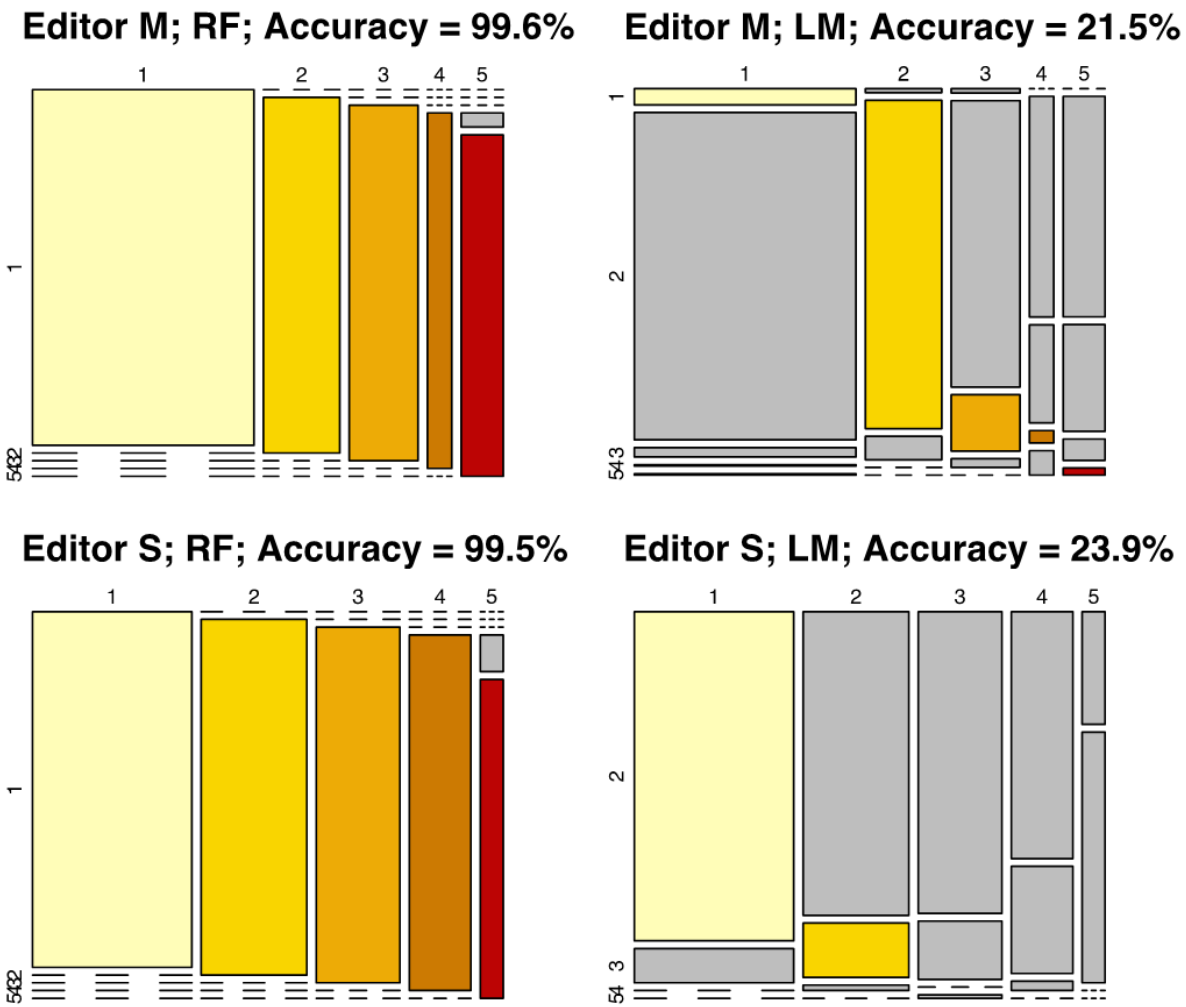


Comparison between visual inspections and linear model predictions



Data-driven pavement crack monitoring and analysis

Difference between two inspectors

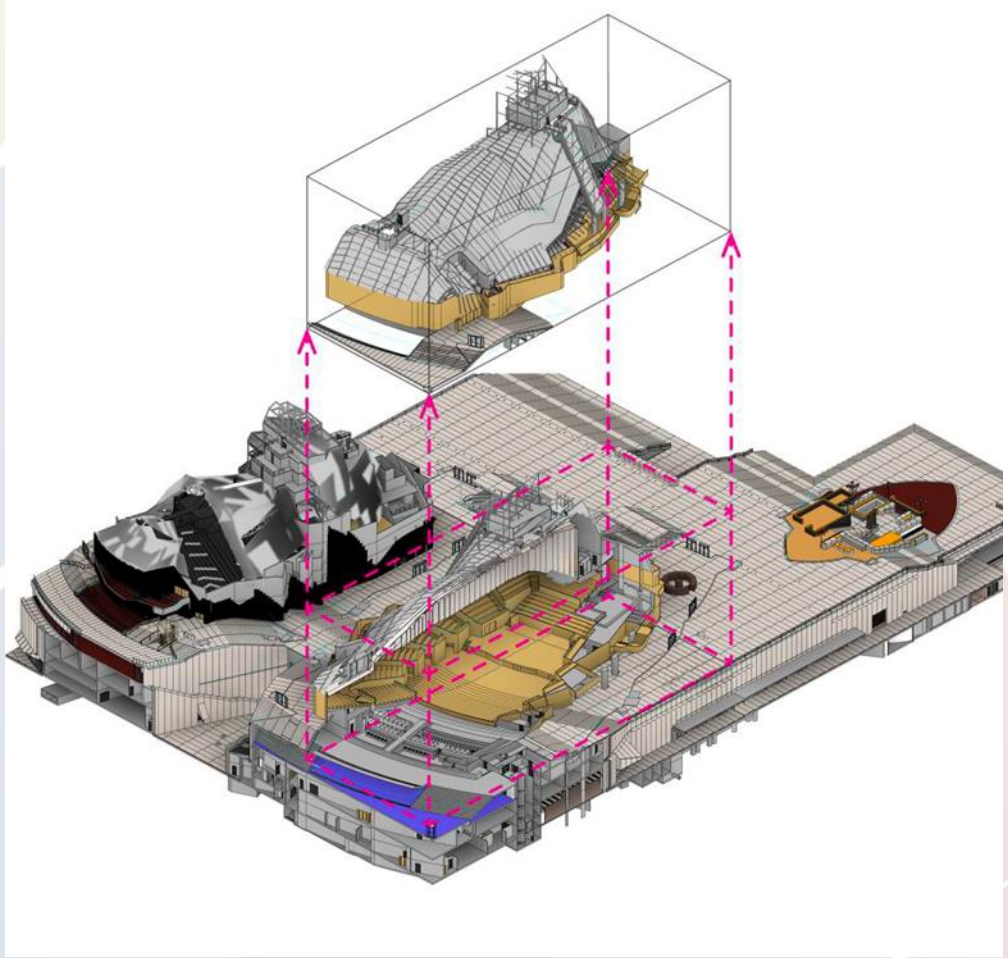


- Machine learning provides more accurate modelling for both inspectors (M and S) than linear models.
- Linear models show that the inspection of Editor M is more accurate in roads of high cracking scores (e.g., 2, 3), and the inspection of Editor S is more accurate in roads with low cracking scores (e.g., 1).
- If we differentiate inspectors, the accuracy of machine learning can be critically improved, but the accuracy of linear regression is similar with the combined data.

Digital engineering standards and implementation

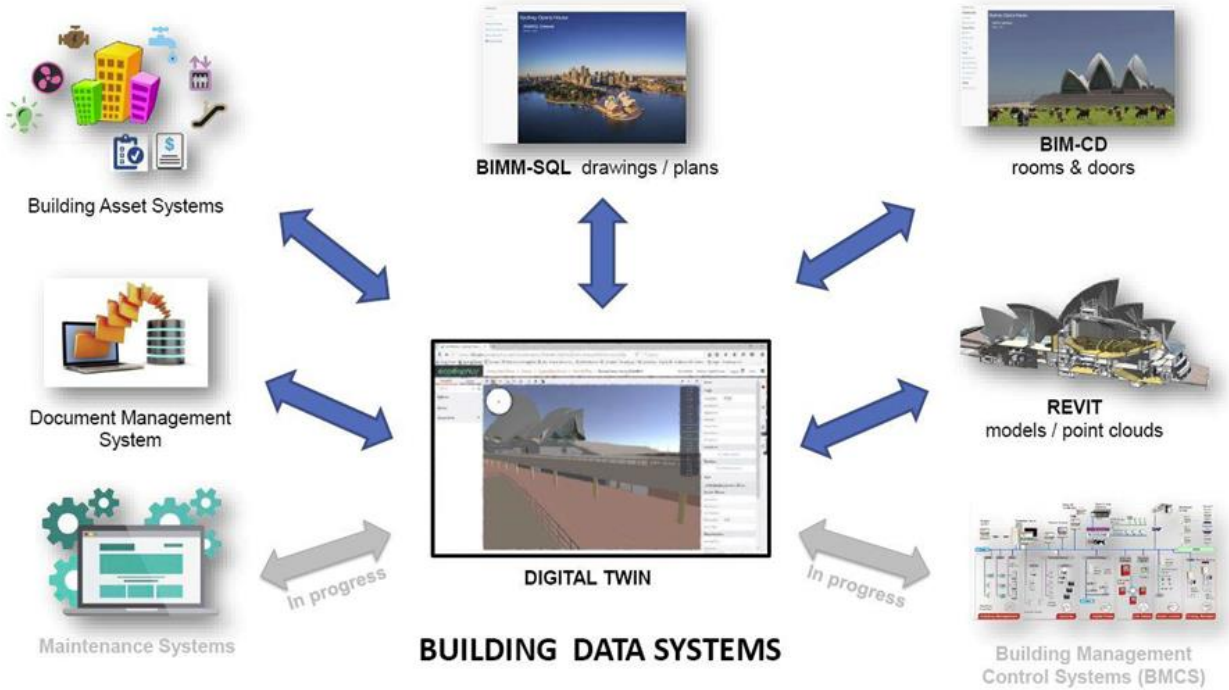
SOH-DE.000 Series : DIGITAL ENGINEERING INTRODUCTION & PRELIMINARIES							
SOH-DE.010	DE Introduction & Preliminaries	DIP	●	●	●	●	●
SOH-DE.100 Series : CONTRACT DOCUMENTS							
SOH-DE.110	BIM Execution Plan	BEP	●	●	●	●	●
SOH-DE.200 Series : USER STANDARDS							
SOH-DE.210	Model Management Standard	MMS	●	●	●	●	
SOH-DE.220	Computer Aided Drafting	CAD	●	●	●	●	
SOH-DE.230	Survey Control	SVY	●	●	●	●	●
SOH-DE.240	Technical Numbering	TCN	●	●	●	●	●
SOH-DE.250	Operation & Maintenance Manual Formatting	OMM				●	●
SOH-DE.300 Series : PROJECT DELIVERABLES							
SOH.DE.310	Model Compliance Checklist	MCC		●	●	●	●
SOH-DE.320	Operation & Maintenance Manual Compliance Checklist	OCC				●	●

Digital engineering standards and implementation



Asset Classification

Open BIM Workflow



Moving forward

2021-2023. P2.82. Digitally-enabled Asset Life-cycle Management

This project seeks to examine the industry best practices and international standards related to the value of DE and BIM and develop a practical approach that can efficiently guide industry people to keep their DE models alive after construction and handover.

We welcome potential partners who intend to explore the benefits of advanced digital engineering and artificial intelligence approaches in their daily practices.

Resources

2017. P2.51. Developing a Cross Sector Digital Asset Information Model Framework for Asset Management
https://sbenrc.com.au/research-programs/2-51/

2018. P2.64. Unlocking Facility Value through Lifecycle Thinking
https://sbenrc.com.au/research-programs/2-64/

2020. P2.72. Leveraging an Integrated Information Lifecycle Management Framework – Building and Infrastructure Sectors
https://sbenrc.com.au/research-programs/2-72/

2021. P2.82. Digitally-enabled Asset Life-cycle Management
https://sbenrc.com.au/research-programs/2-82/