International Council for Research and Innovation in Building and Construction

Sustainable **Built Environment** National Research Centre AUSTRALIA

CIB World Building Congress 2019

The Honk Kong Polytechnic University, Hong Kong – 17 to 21 June 2019

Using BIM for ongoing Building Operations throughout a Building's Lifecycle

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SBEnrc Core Partners

aurecon

BGC

GOVERNMENT OF WESTERN AUSTRALIA

Queensland Government

Roads & Maritime

Curtin University

Griffith UNIVERSITY

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Collaborating National Partners

# Collaborating National Partners

Collaborating International Partners

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POLITECNICO MILANO

CSTB le futur en construction

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서 울 대 학 교 SEOUL NATIONAL UNIVERSITY

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

NTNU Norwegian University of Science and Technology

MASSEY UNIVERSITY UNIVERSITY OF NEW ZEALAND

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VTT

CHALMERS UNIVERSITY OF TECHNOLOGY

International Council for Research and Innovation in Building and Construction

A? Aalto University

University of Zagreb

U LISBOA | UNIVERSIDADE DE LISBOA

Work of SBEnrc
SBEnrc Projects – Organic Evolvement

Sustainable **Built Environment** National Research Centre AUSTRALIA
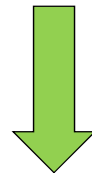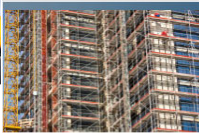
Completed

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

In 2013, the Australian Department of Industry identified lifting productivity and economic growth as

Processes — Completed

3.27 Using Building Information Modelling (BIM) for Smarter and Safer Scaffolding Construction

Information Sheet (544Kb, Sept 2014) Temporary structures like scaffolding have a significant impact

Productivity — Completed

3.28 National BIM Guidelines and Case Studies for Infrastructure

Information Sheet (472Kb, March 2015) Mechanisms that improve collaboration and communication in the

Productivity — Completed

3.48 Sustainable Asset Management: Selecting Optimal Maintenance Strategies Based on Multi-criteria Decision Making

Project Fact Sheet In an economic downturn, it is of critical importance to

Productivity — Completed

2.46 Whole-of-life Value of Constructed Assets through Digital Technologies

In the coming decades Australia and other countries will be facing challenges as a

Processes — Current

Current

Unlocking Facility through Lifecycle thinking

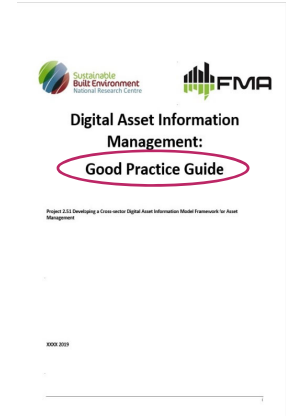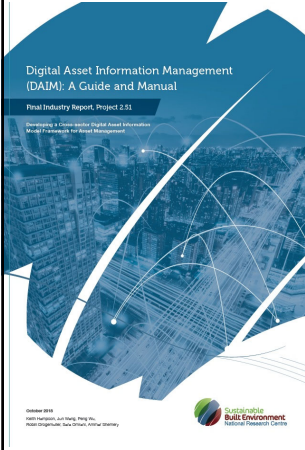ect Fact Sheet (320Kb, 018) Lifecycle thinking ignificant potential for improving the
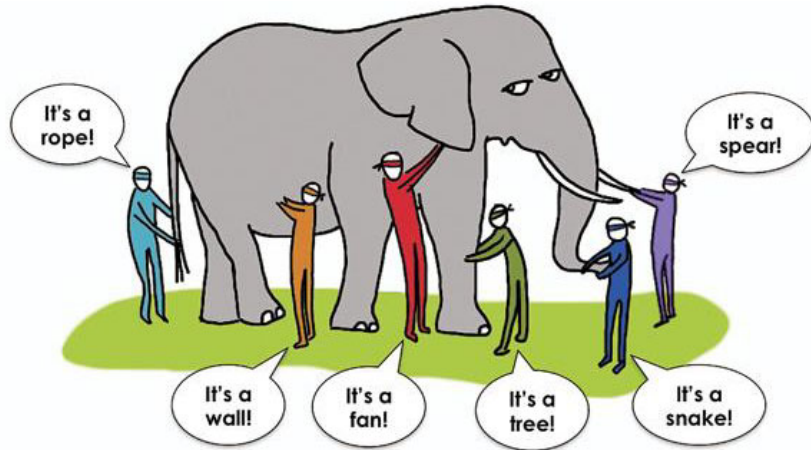
Processes — Current

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Outputs

SBEnrc Project 2.51: Developing a Cross-Sector Digital Asset Information Model Framework for Asset Management (DAIM)
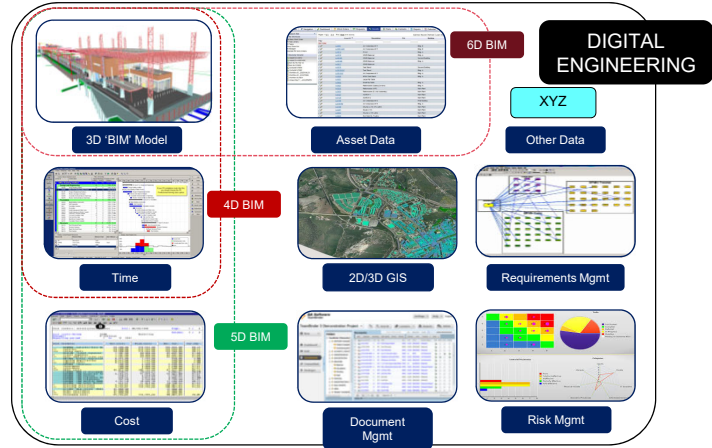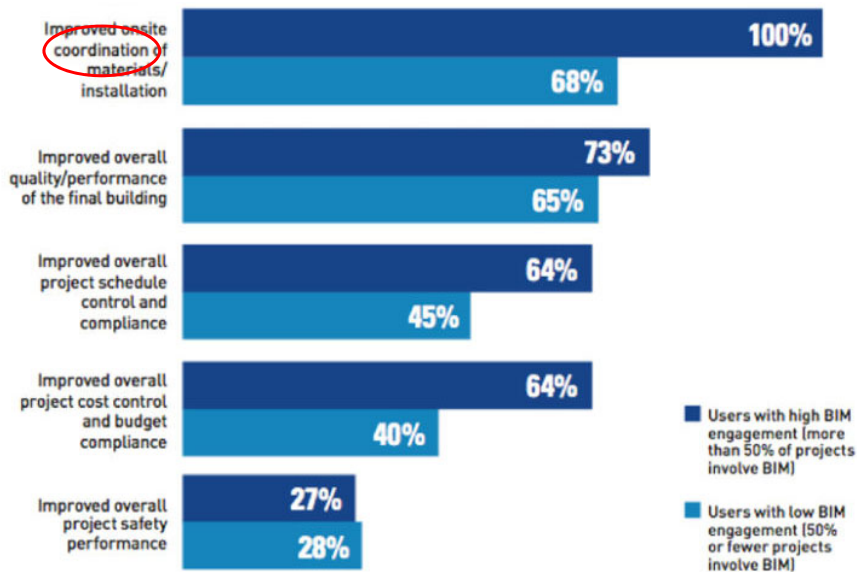
What is BIM?

What is BIM (or Digital Engineering-DE)?
The dream…

A representation of project and asset information management systems linked to enable collaboration throughout the asset lifecycle

3D 'BIM' Model | Asset Data | 6D BIM | DIGITAL ENGINEERING
XYZ | Other Data
4D BIM | Time | 2D/3D GIS | Requirements Mgmt
5D BIM | Cost | Document Mgmt | Risk Mgmt

Source, TfNSW

What value BIM brings to your projects?
Autodesk global survey (2018)

Improved onsite coordination of materials/ installation — 100% / 68%

Improved overall quality/performance of the final building — 73% / 65%

Improved overall project schedule control and compliance — 64% / 45%

Improved overall project cost control and budget compliance — 64% / 40%

Improved overall project safety performance — 27% / 28%

Users with high BIM engagement (more than 50% of projects involve BIM)

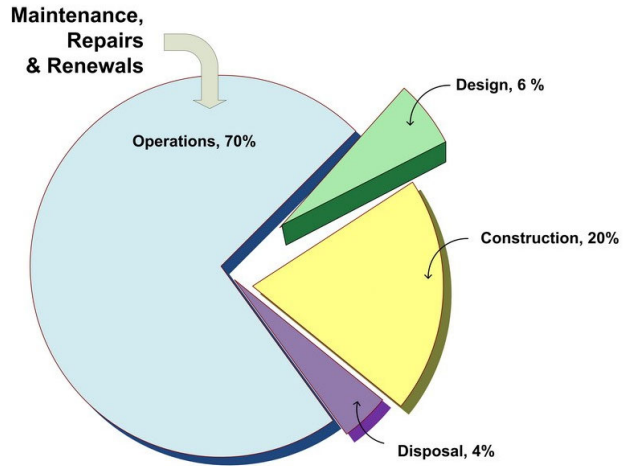Users with low BIM engagement (50% or fewer projects involve BIM)

BIM and whole of asset lifecycle
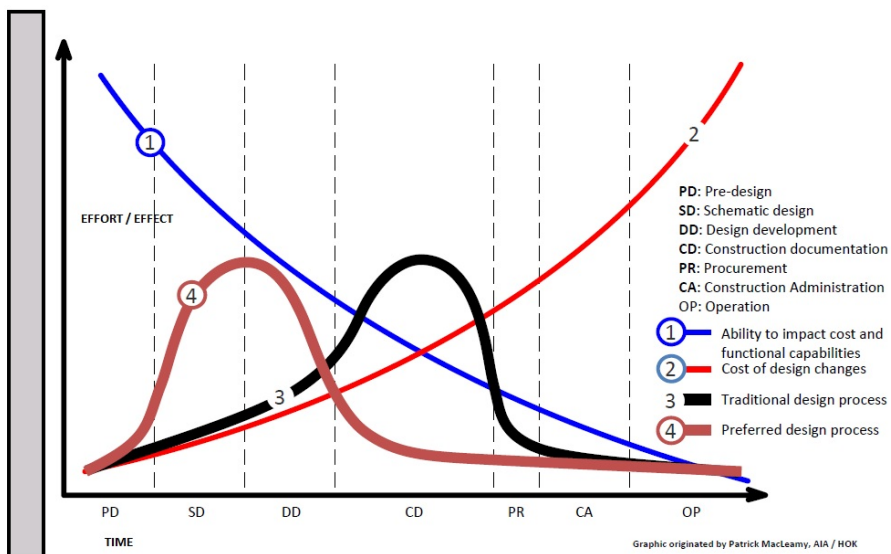**Design and construction cost vs O&M cost**

Capital constrained environment

BIM and whole of asset lifecycle
BIM workflow vs traditional process

BIM and whole of asset lifecycle
UK Cabinet BIM Strategy Paper

… primary benefits of using BIM in infrastructure:

20% reduction in build costs

33% reduction in costs over the lifetime of the asset

56% reduction in conflicts and re-work during construction

51% increase in overall project quality

39% reduction in risk, improved predictability

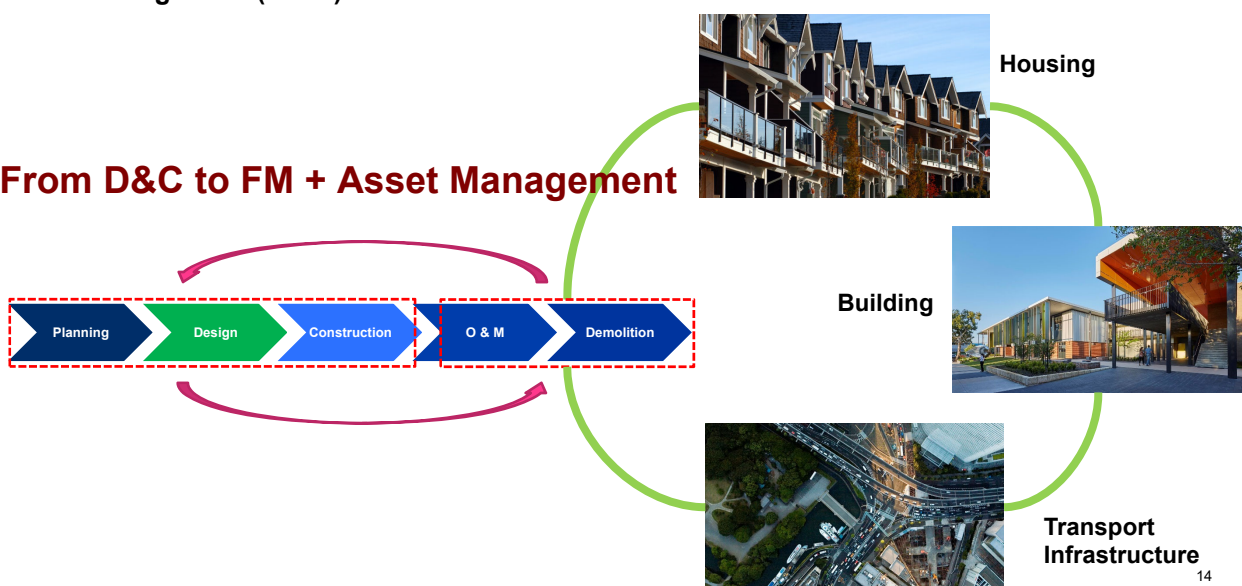**37%** better performing completed infrastructure

Source: IPWEA, 2016

'Build and manage virtually … then actually'

13

Why?
SBEnrc Project 2.51: Developing a Cross-Sector Digital Asset Information Model Framework for Asset Management (**DAIM**)

From D&C to FM + Asset Management

Planning | Design | Construction | O & M | Demolition

Housing

Building

Transport Infrastructure

14

Method

Research question:
'What type of asset information is needed for BIM/DE to add value to an asset's lifecycle and specifically the operational phase'

Literature review including a comprehensive review of current asset management standards and practices in Australia, UK, US, EU and globally has shaped the direction of this research.

Ten case studies across Australia were referenced as project outputs to test the theoretical framework of this project.

Major difference between non-digital asset management and digital asset management is 'structured data'

15

Building Models from design through to FM

BIM Design Models

Developed by the design team with a level of development to relay design intent and generate documentation and details used during construction

BIM Construction Models

Contains a high level of detail used before and during actual construction to reduce uncertainty, improve safety, eliminate conflicts and simulate real world outcomes

BIM As-Built Model

Contains both construction and fabrication data with detailed geometry and multiple disciplines that facilitates turnover from AEC to owners
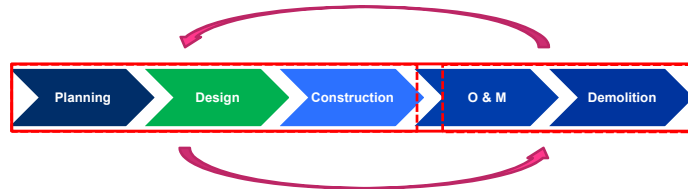
BIM FM Model

Is derived from the BIM As-Built model removing details, sheets, and other extraneous information, and defining rooms, spaces, assets by unique identifiers. The BIM FM model is then linked with the facility management system for ongoing management

Design

Time

Operations
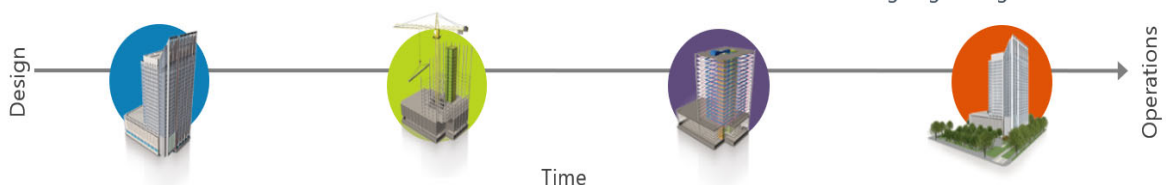
Method

Asset information is generated across the asset lifecycle

- Completeness
- Correctness
- Consistency
- Clarity
- Integrity
- Uniqueness

Case Study
James Cook University (JCU) – Queensland, Australia

Sustainable
Built Environment
National Research Centre

Challenges
- Manual coordination
- Delays, cost increase, clashes…etc.
- Operational team (FM) struggling
- Sourcing the right data in useable formats proved difficult, which led to the double handling of data as it was manually entered into management systems.

Before BIM

JCU Science Building

Case Study
James Cook University – Queensland, Australia

Solutions

Data collection stage:

- BIM/FM Working Group
- Data collection and analysis included:
    1. Digitising of record drawings
    2. On-site truthing and measure-ups
    3. Conversion of CAD drawings
  The steps above provided the base Revit models

BIMAssure

Data identification stage :

- BIM specifications,
    - ❖ deliverable requirements for Revit version
    - ❖ Level of Detail (LOD)
    - ❖ Family naming conventions
    - ❖ Categorisation and associated parameter naming

IWMS

360 buildings and 230,000m² of floor area modelled in Autodesk Revit, linked with their Integrated Workplace Management System (FM:Interact)

After BIM

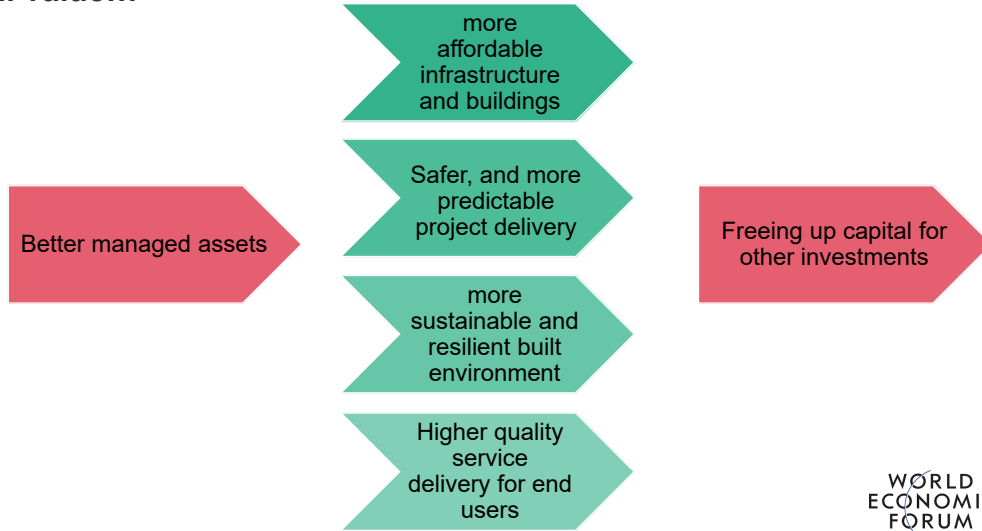## Case Study
James Cook University – Queensland, Australia

Results

- FM Team had the information necessary to do their tasks

- IT staff had access to physical network traces …… suitable for their timetabling system

- More efficient FM practice…. led to a more comprehensive understanding of the University's building stock and has contributed to offset the reduction in government funding

- The space types were mapped, allowing for cost modelling of the University's activities carried out versus the maintenance costs associated with those spaces

- With an additional feed of Human Resource data, the University began modelling more efficient space allocations, comparing the staff assigned to a building with the amount and type of space in that building

- The result being that the University could reduce the total built footprint while improving services to students

Ideal case of using BIM throughout the asset lifecycle

Conclusions

BIM value…

Better managed assets

more affordable infrastructure and buildings

Safer, and more predictable project delivery

more sustainable and resilient built environment

Higher quality service delivery for end users

Freeing up capital for other investments

WORLD ECONOMIC FORUM

21

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