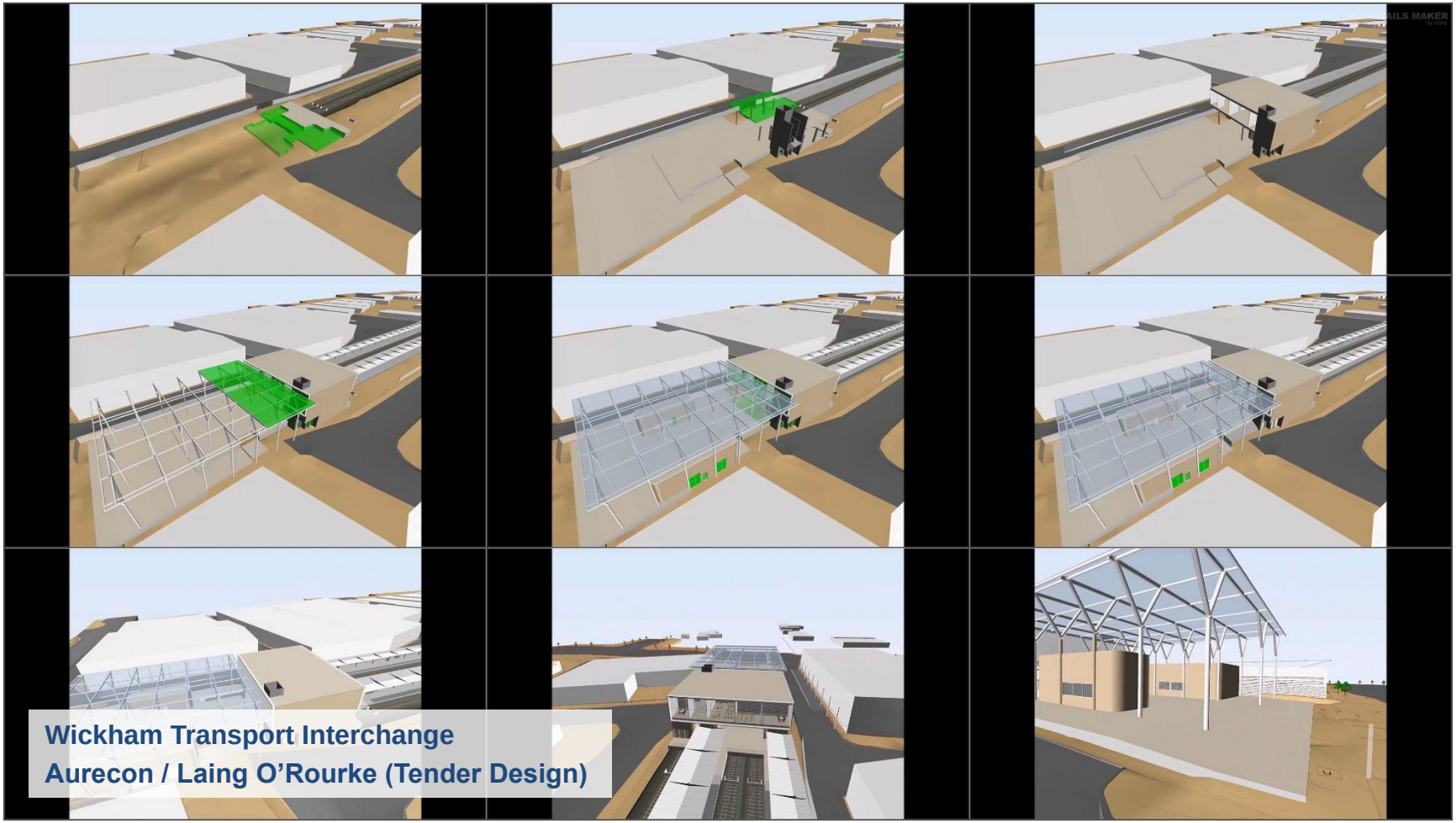
Transport for NSW
Digital Engineering Strategy

Simon Vaux

Digital Engineering



Wickham Transport Interchange
Aurecon / Laing O'Rourke (Tender Design)

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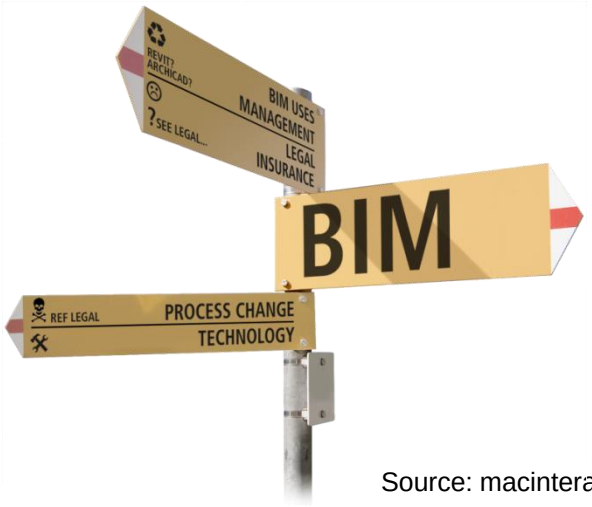
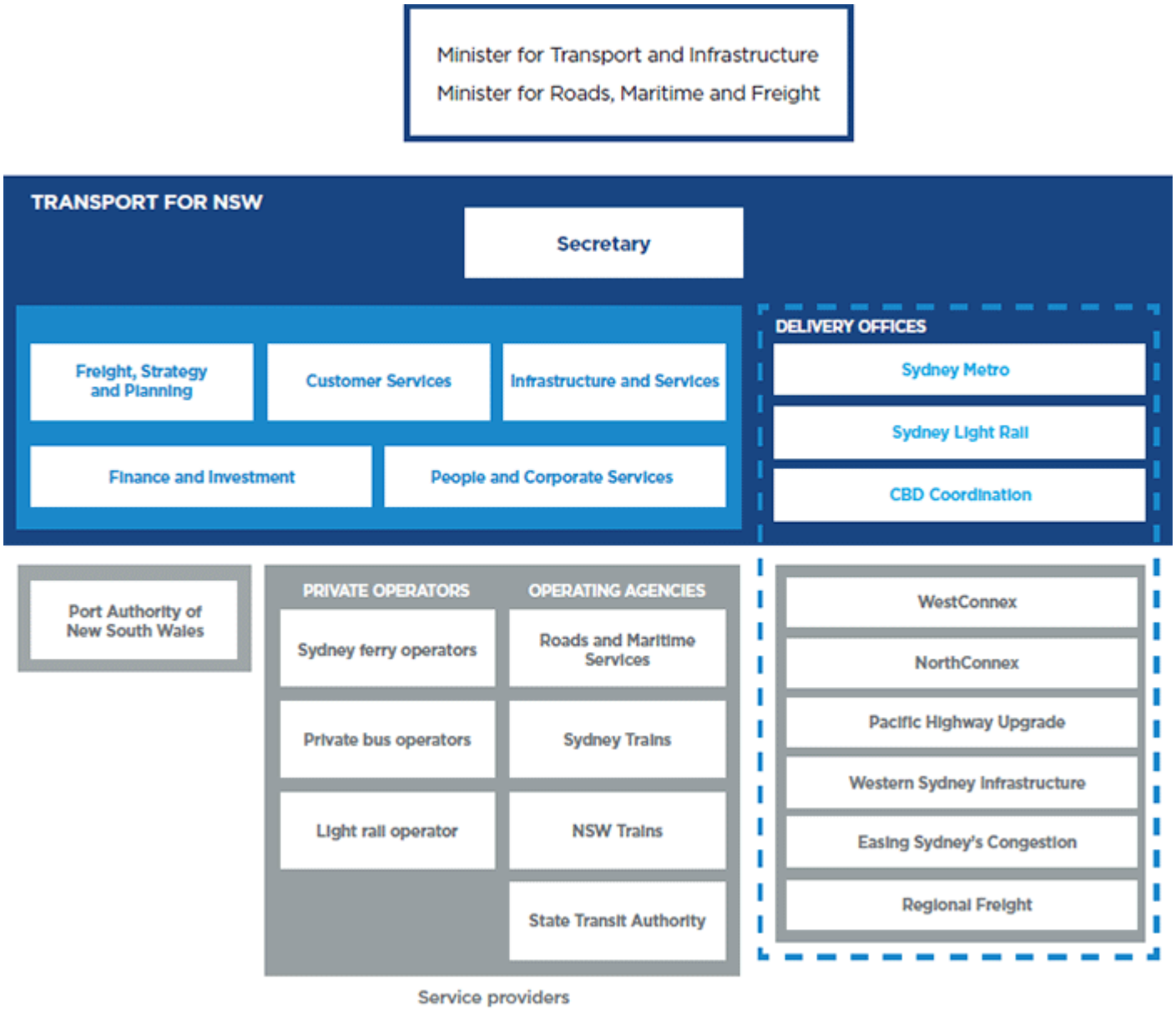
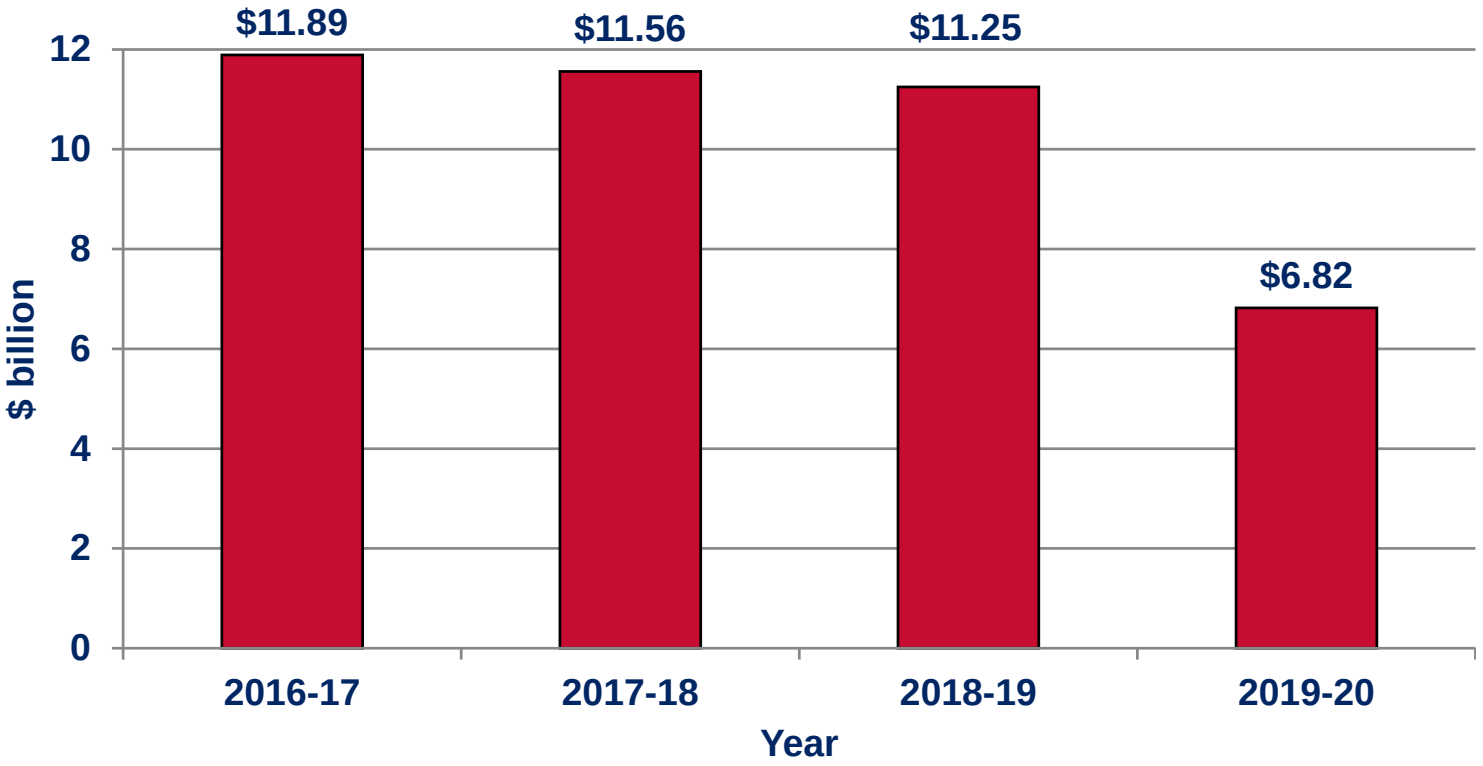
2. What is Digital Engineering?
3. The TfNSW strategy
4. National Initiatives
5. Lessons Learned



Source: macinteract.com


Minister for Transport and Infrastructure
Minister for Roads, Maritime and Freight
TRANSPORT FOR NSW
Secretary
Freight, Strategy and Planning
Customer Services
Infrastructure and Services
Finance and Investment
People and Corporate Services
DELIVERY OFFICES
Sydney Metro
Sydney Light Rail
CBD Coordination
Port Authority of New South Wales
PRIVATE OPERATORS
OPERATING AGENCIES
Sydney ferry operators
Roads and Maritime Services
Private bus operators
Sydney Trains
Light rail operator
NSW Trains
State Transit Authority
WestConnex
NorthConnex
Pacific Highway Upgrade
Western Sydney Infrastructure
Easing Sydney's Congestion
Regional Freight
Service providers

“The Wave”



- $41.5 bil invested on Transport over 4 years
- Approx 57% of NSW budget ($73.3 bil)

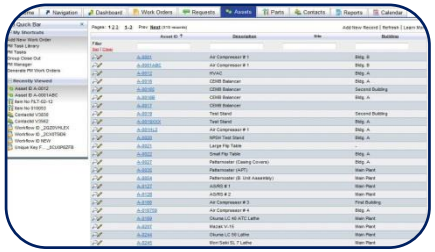
2016-17 NSW Budget

What is Digital Engineering?

- DE is simply a collaborative way of working, using digital processes, to enable more productive methods of planning, designing, constructing, operating and maintaining our assets
- This is achieved by creating a Common Data Environment (CDE), that aligns digital information systems including CAD, GIS, 3D BIM, electronic document management, project controls (time, cost, risk etc), asset data and other related systems.
- DE provides faster, clearer and more accurate project and asset information
- Enables greater capability, quality and cost effectiveness for:
  - Strategic planning
  - Project outcomes
  - Asset management
  - Broader network operations

DIGITAL ENGINEERING

3D ‘BIM’ Model

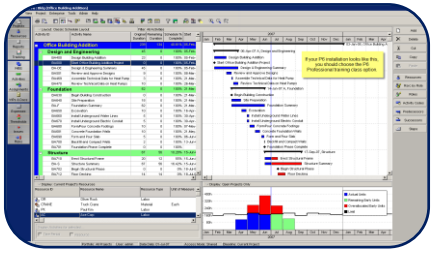


6D BIM

Asset Data

XYZ

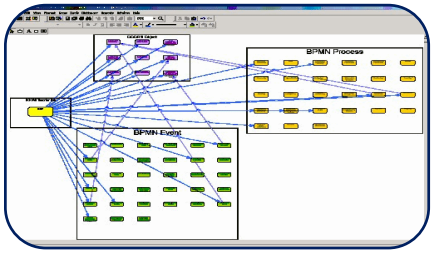
Other Data



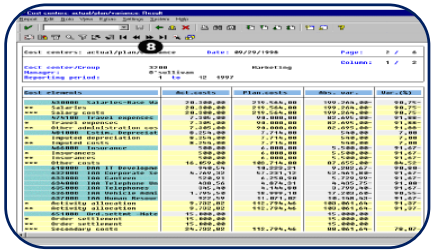
4D BIM

Time

2D/3D GIS

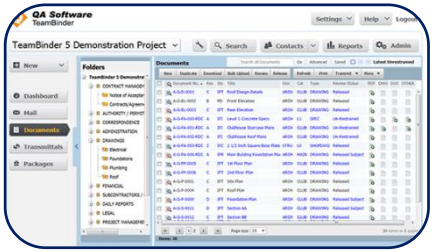


Requirements Mgmt

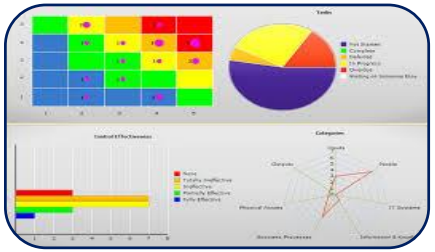


5D BIM

Cost

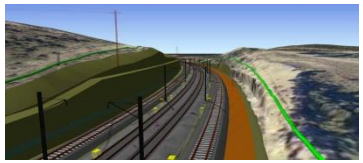


Document Mgmt

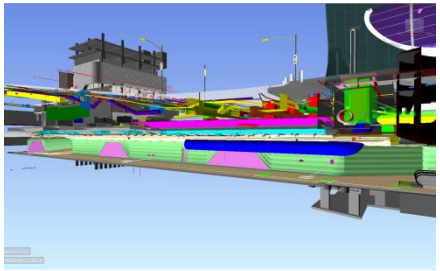


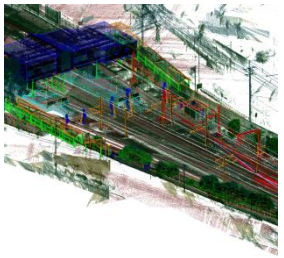
Risk Mgmt

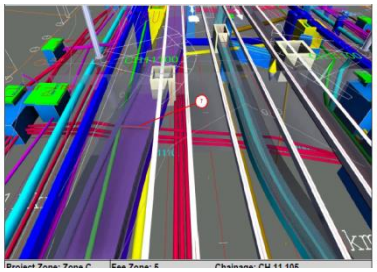
DE in TfNSW

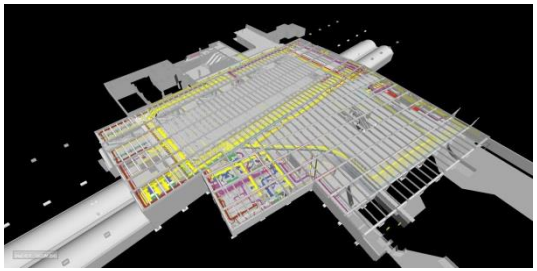


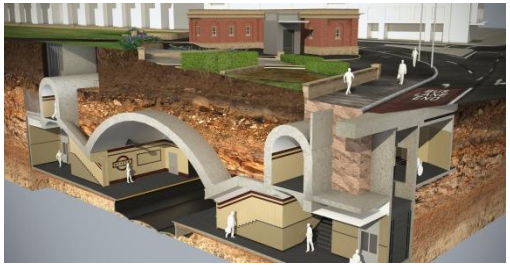
HY77
PAUSED
REVERSE
AUTO PAUSE
INDICATIVE TRAIN OUTLINE
LABELS

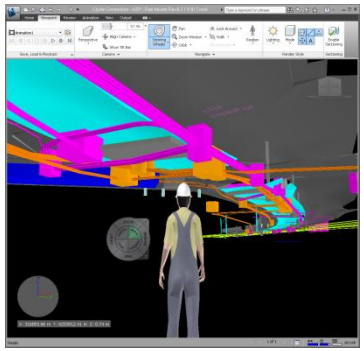


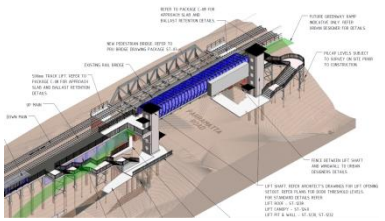


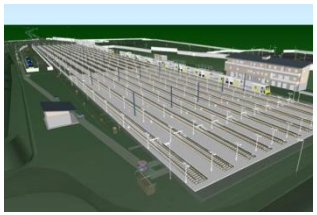


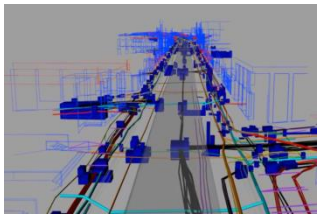


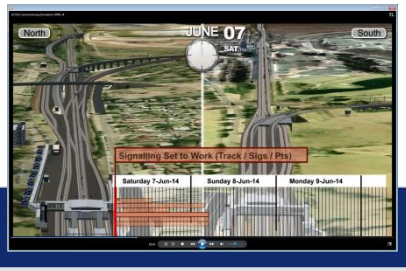


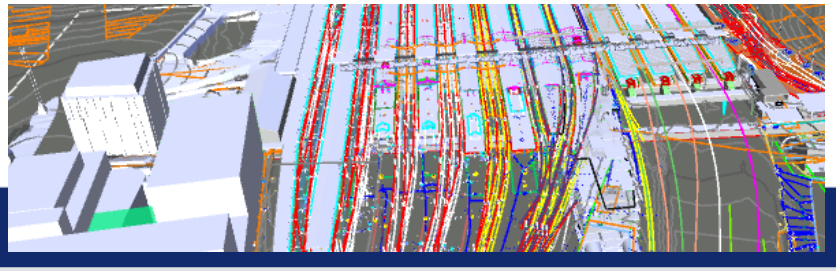




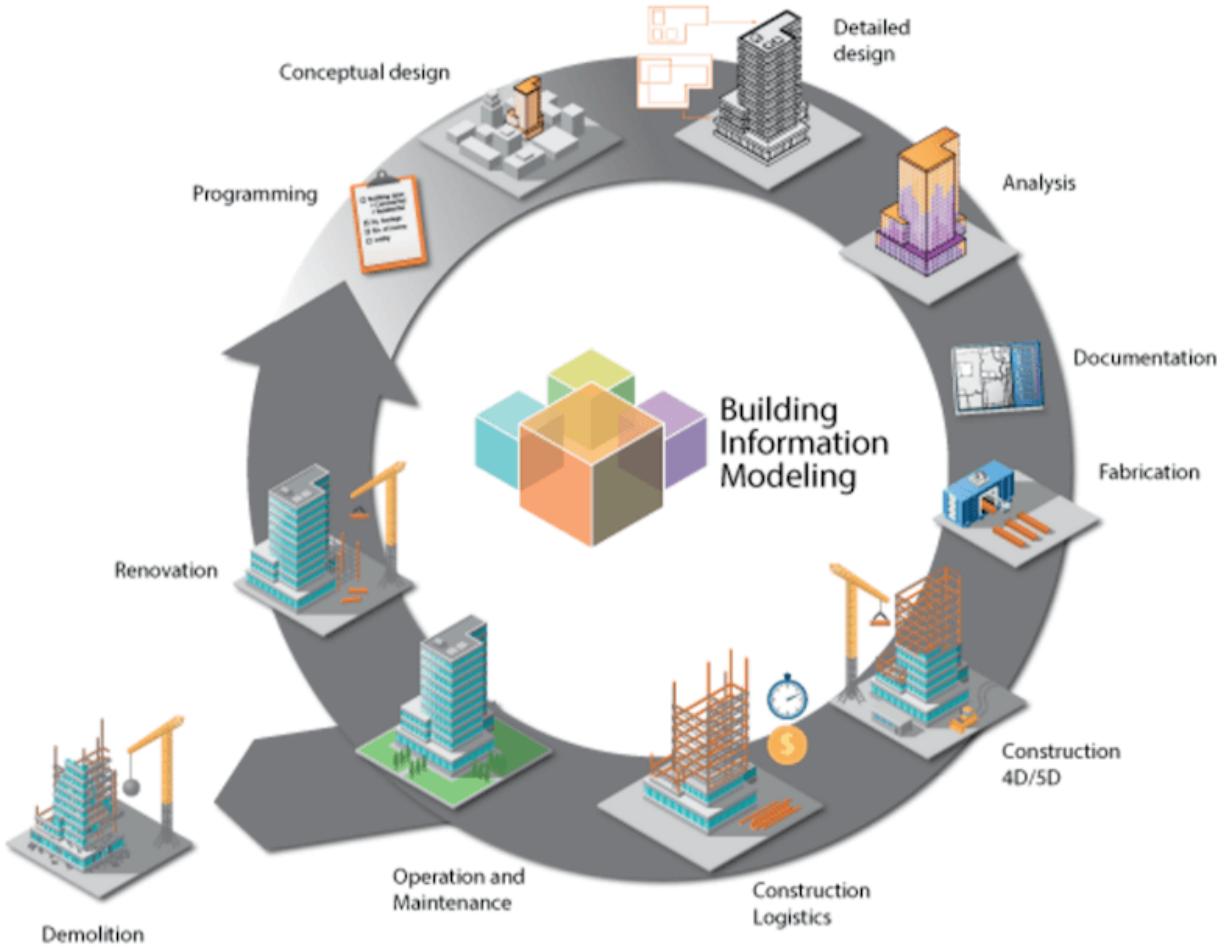


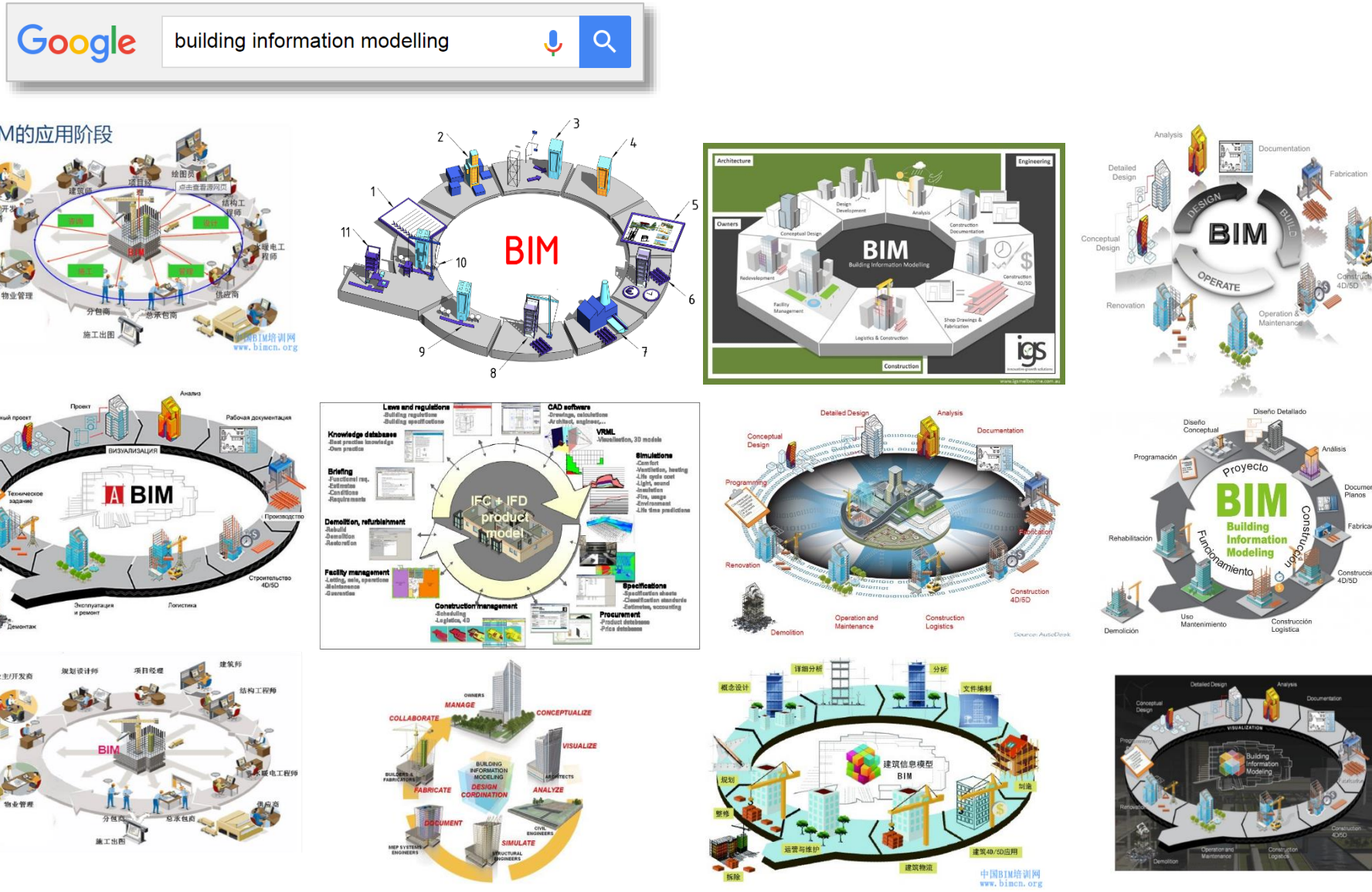



North
JUNE 07
SAT
South
Signalling Set to Work (Track / Sigs / Pts)
Saturday 7-Jun-14
Sunday 8-Jun-14
Monday 9-Jun-14

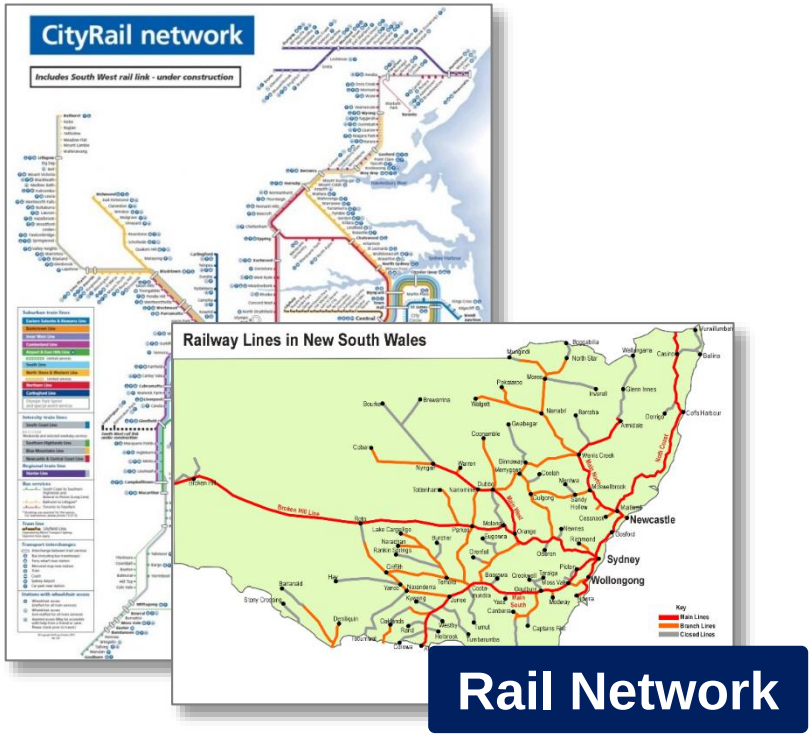


Google building information modelling

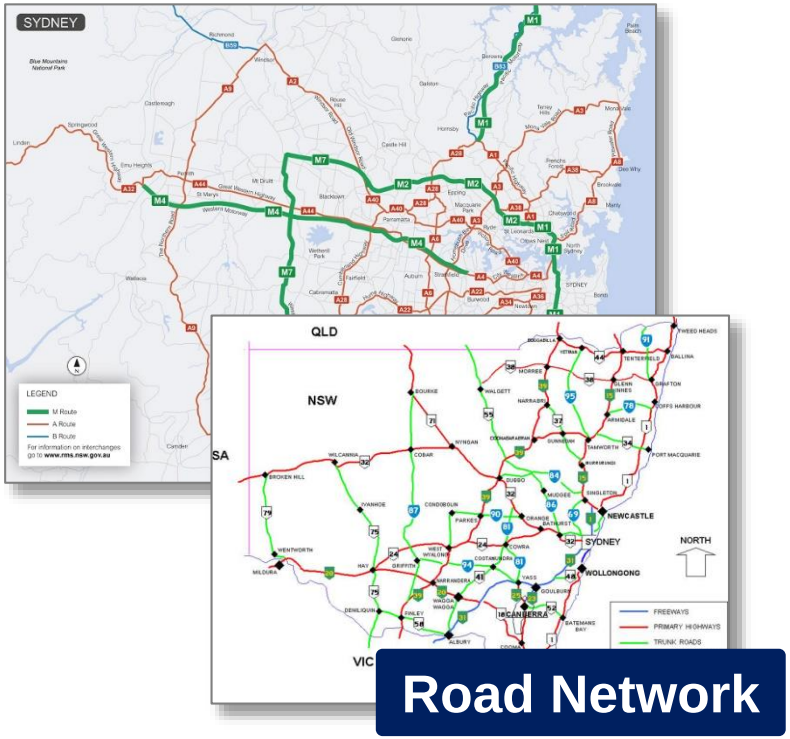



Google
building information modelling
BIM的应用阶段
BIM
Architecture
Engineering
Owners
Construction
Design Development
Conceptual Design
Analysis
Construction Documentation
Redevelopment
Facility Management
Logistics & Construction
Shop Drawings & Fabrication
Construction 4D/5D
Building Information Modelling
Documentation
Fabrication
Detailed Design
Conceptual Design
Construction Logistics
Renovation
Operation & Maintenance
DESIGN
BUILD
OPERATE
Проект
Эскизный проект
Рабочая документация
ВИЗУАЛИЗАЦИЯ
Техническое задание
Производство
Строительство 4D/5D
Логистика
Эксплуатация и ремонт
Демонтаж
Реконструкция
Laws and regulations
CAD software
Knowledge databases
VRML
Briefing
Simulations
IFC + IFD product model
Demolition, refurbishment
Facility management
Specifications
Construction management
Procurement
Diseño Conceptual
Diseño Detallado
Programación
Análisis
Proyecto
Documentación Planos
Fabricación
Rehabilitación
Construcción 4D/5D
Demolición
Uso Mantenimiento
Construcción Logística
Funcionamiento
Construcción
OWNERS
MANAGE
CONCEPTUALIZE
COLLABORATE
VISUALIZE
BUILDING INFORMATION MODELING
DESIGN CORDINATION
FABRICATE
ANALYZE
DOCUMENT
SIMULATE
详细分析
分析
概念设计
文件编制
建筑信息模型
BIM
规划
制造
整修
运营与维护
建筑4D/5D应用
建筑物流
拆除
中国BIM培训网
www.bimcn.org

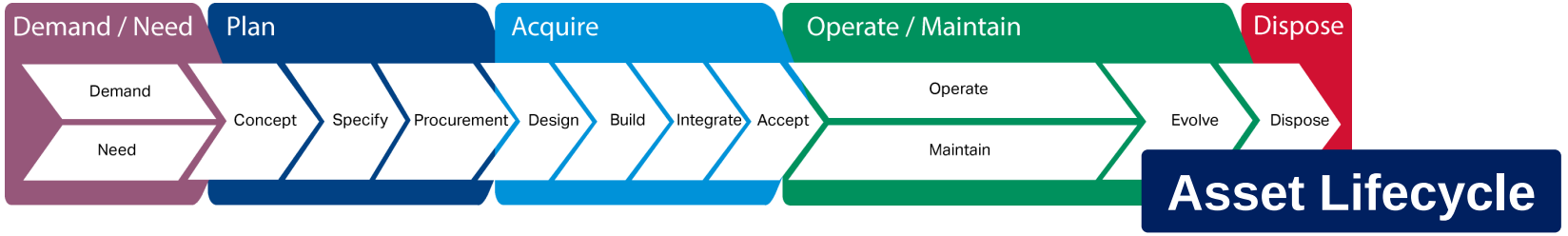
Transport Networks



Rail Network



Road Network



Asset Lifecycle

Vertical vs Linear Infrastructure

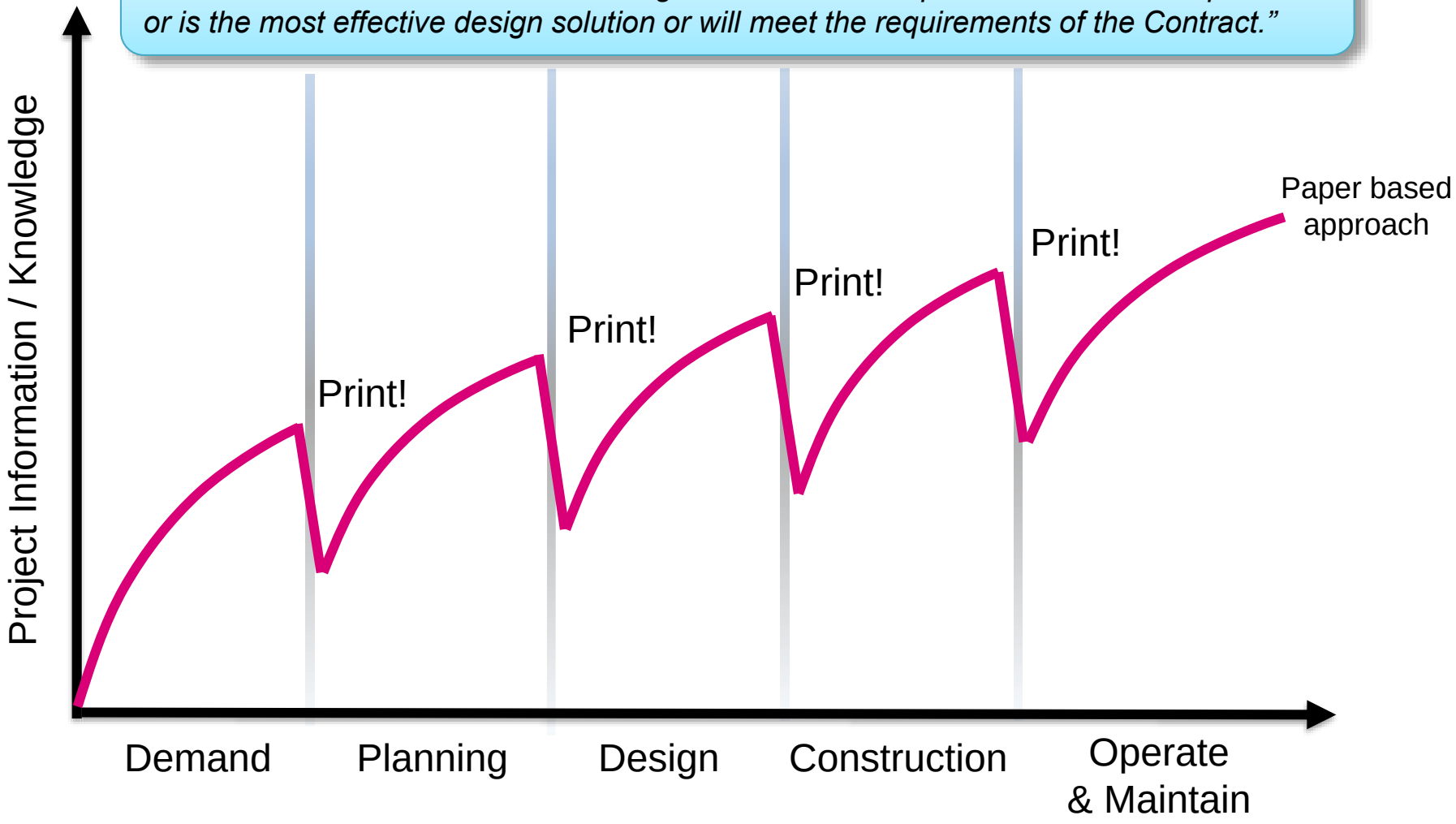
Factors impacting BIM	Vertical Infrastructure	Horizontal Infrastructure
Description	The discrete buildings which support our physical accommodation, business activities and health needs	The networks of built assets that provide service and must connect through constrained gradients and curves
Example	Housing, office buildings, hospitals	Road and rail lines
3D Design Methodology	Object-based modelling	String and alignment-based modelling
Location Breakdown	A simple hierarchical breakdown is sufficient e.g. IFC	A linear breakdown consisting of a combination of lines, points and distance along lines e.g. Asset Classification
Geometric Models	Object geometry is set in local coordinates, meaning model coordinates can only be extrapolated to the real world with difficulty.	String and point "real-world" GDA coordinates are required ie GIS
Service Performance	Contribution to organisation strategic objectives (Corporate Real Estate approach or Strategic FM	Network performance and maintenance of service delivery, such as maintaining uninterrupted journeys along a road.
Status of Information Use	Mature BIM models for design, data management and information exchange to asset management (COBie)	Lacking an exchange format to asset management

* Note: many infrastructure projects mix these two types, such as entrance roads and landscaping for building projects, or bridges and stations on rail corridors.

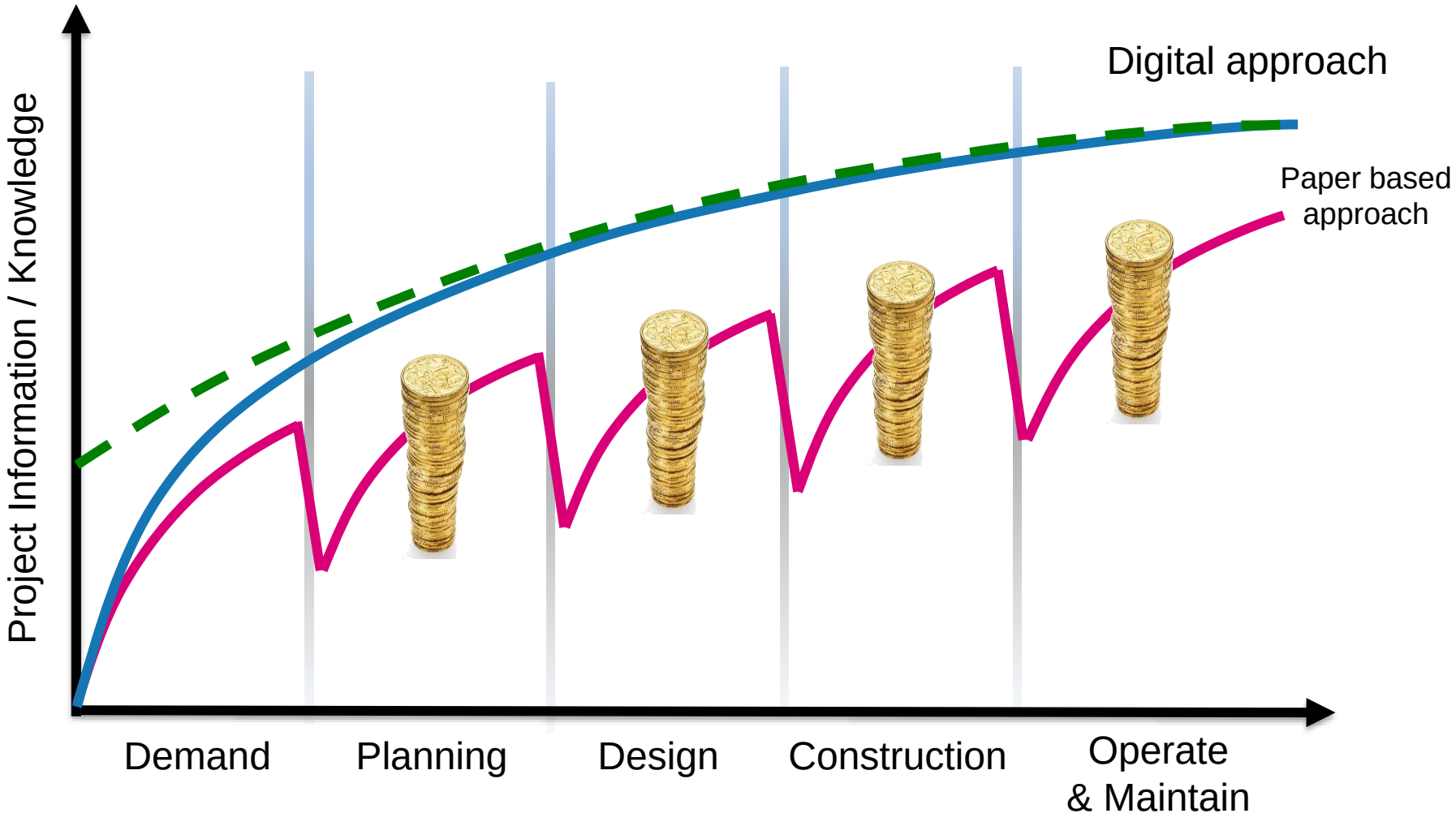
Source: Prof Russell Kenley, Swinburne University of Technology

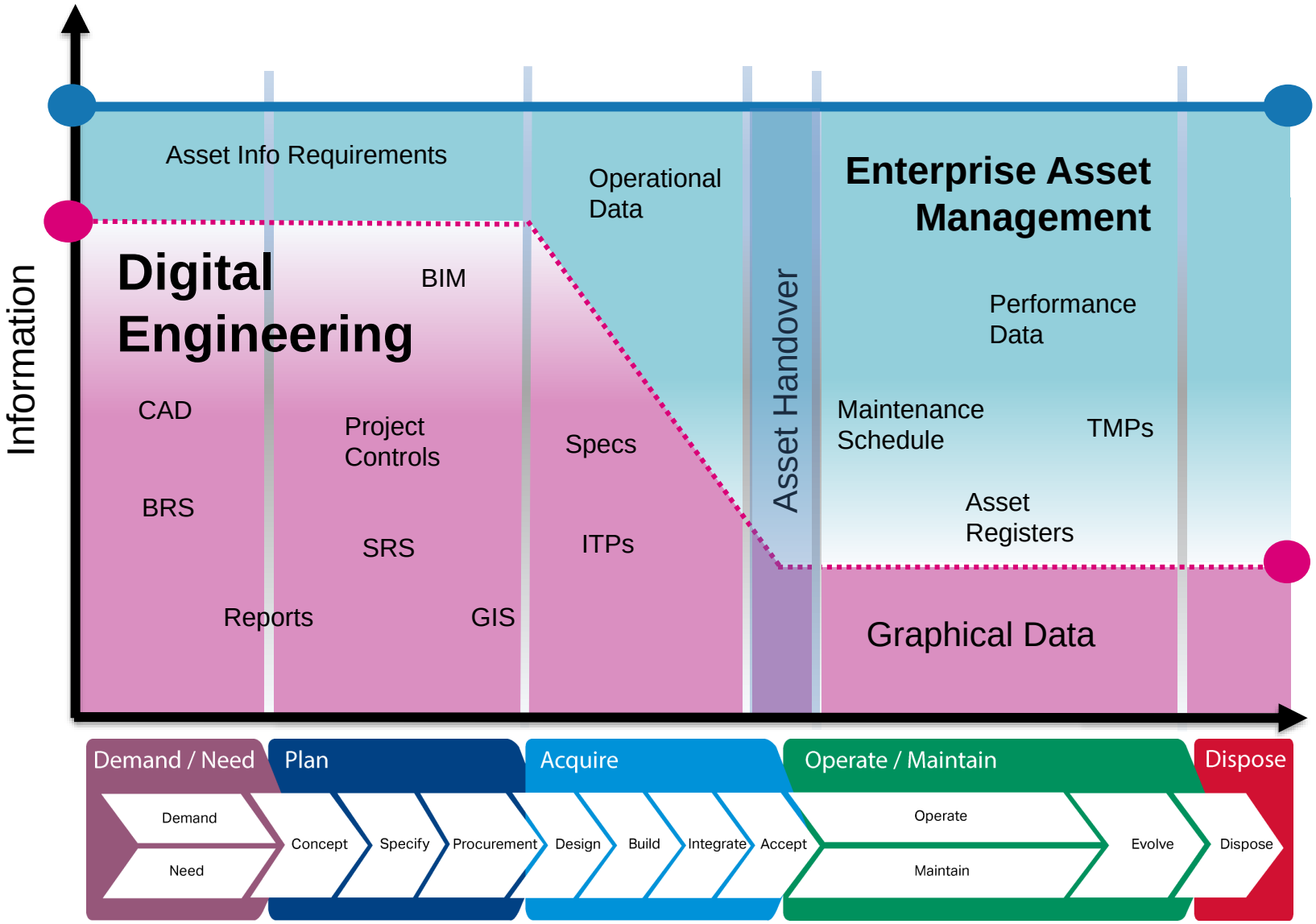
Traditional Projects

"The Principal does not warrant, guarantee, represent or assume any duty of care to the Technical Advisor that the Tender Design is accurate, adequate, suitable or complete, or is the most effective design solution or will meet the requirements of the Contract."



Digital approach




Information
Asset Info Requirements
Operational Data
Enterprise Asset Management
Digital Engineering
BIM
Performance Data
CAD
Project Controls
Specs
Maintenance Schedule
TMPs
BRS
SRS
ITPs
Asset Registers
Reports
GIS
Graphical Data
Asset Handover
Demand / Need
Plan
Acquire
Operate / Maintain
Dispose
Demand
Need
Concept
Specify
Procurement
Design
Build
Integrate
Accept
Operate
Maintain
Evolve
Dispose

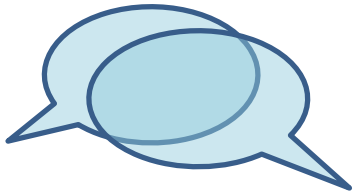
DE Elements

- Universal system
  - Asset Classification
  - Asset Location
- e.g. Uniclass2015

Standard Coding System

Open Data Format

- Interoperable across platforms and proprietary systems
- eg IFC, CoBie, InfraGML, APIs etc

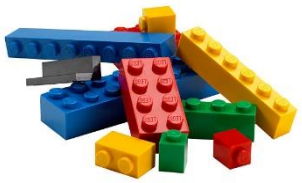


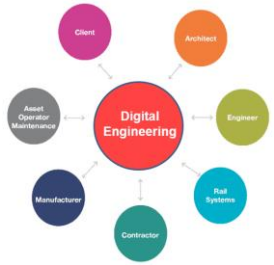
Standard Object Based Models

- Consistent digital representation
- Enables object library for standardised design
- e.g. UK/Global BIM Object Standards

Common Data Environment

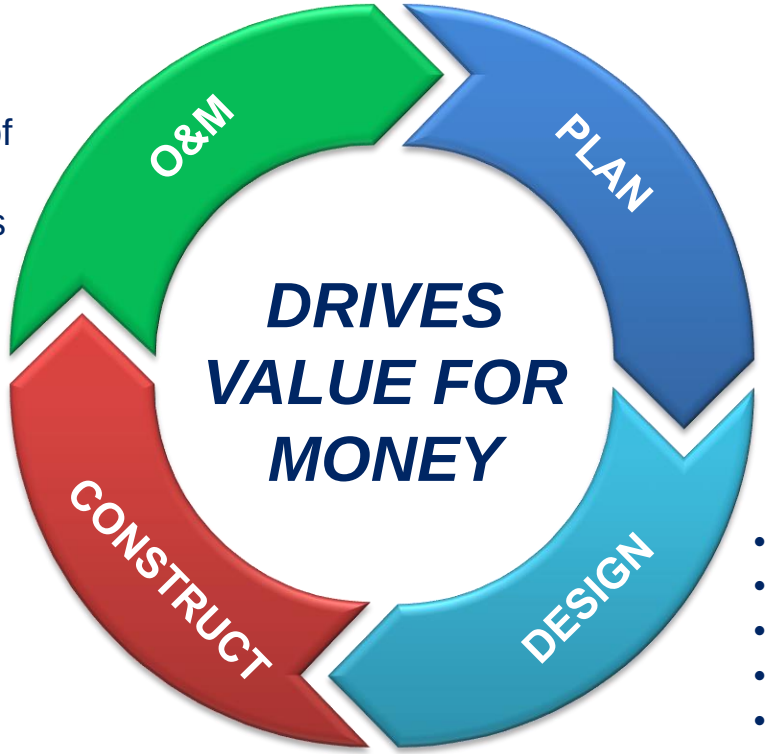
- Repository for collecting & sharing information
- Enables cloud based collaboration





DE Benefits

- Seamless data transition (handover)
- Accelerated understanding of failures or incidents
- More cost effective decisions
- More targeted, preventative maintenance
- Information mobility

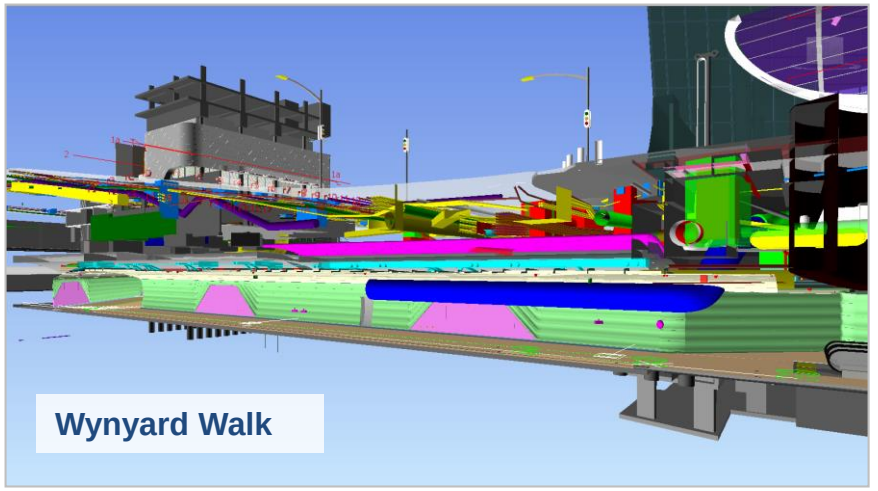


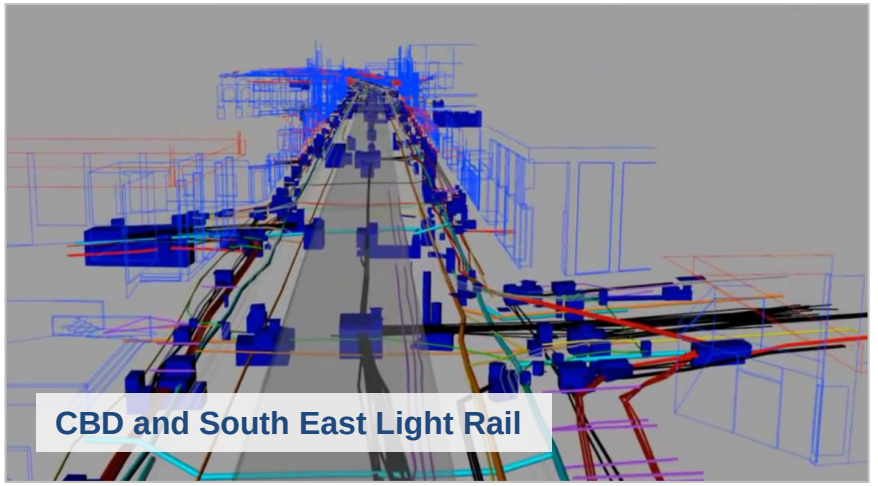
- Reduced risk
- Improved cost certainty
- Improved baseline data
- Improved optioneering for faster decisions
- Reduced site investigation
- Improved prior knowledge

- Improved safety
- Reduced risk
- Improved cost estimating
- Reduced rework
- Off-site fabrication
- Schedule optimisation
- Improved procurement

- Improved design coordination
- Clash detection
- Improved accuracy & drawings
- Early visualisation
- More effective consultation
- Improved configuration control & requirements management

Recent Projects





Where we are now

- Mostly led by Contractors
- Evolving contract req’mnts
- Single purpose or phase
- Basic 3d model
- Deliverables in PDF and paper

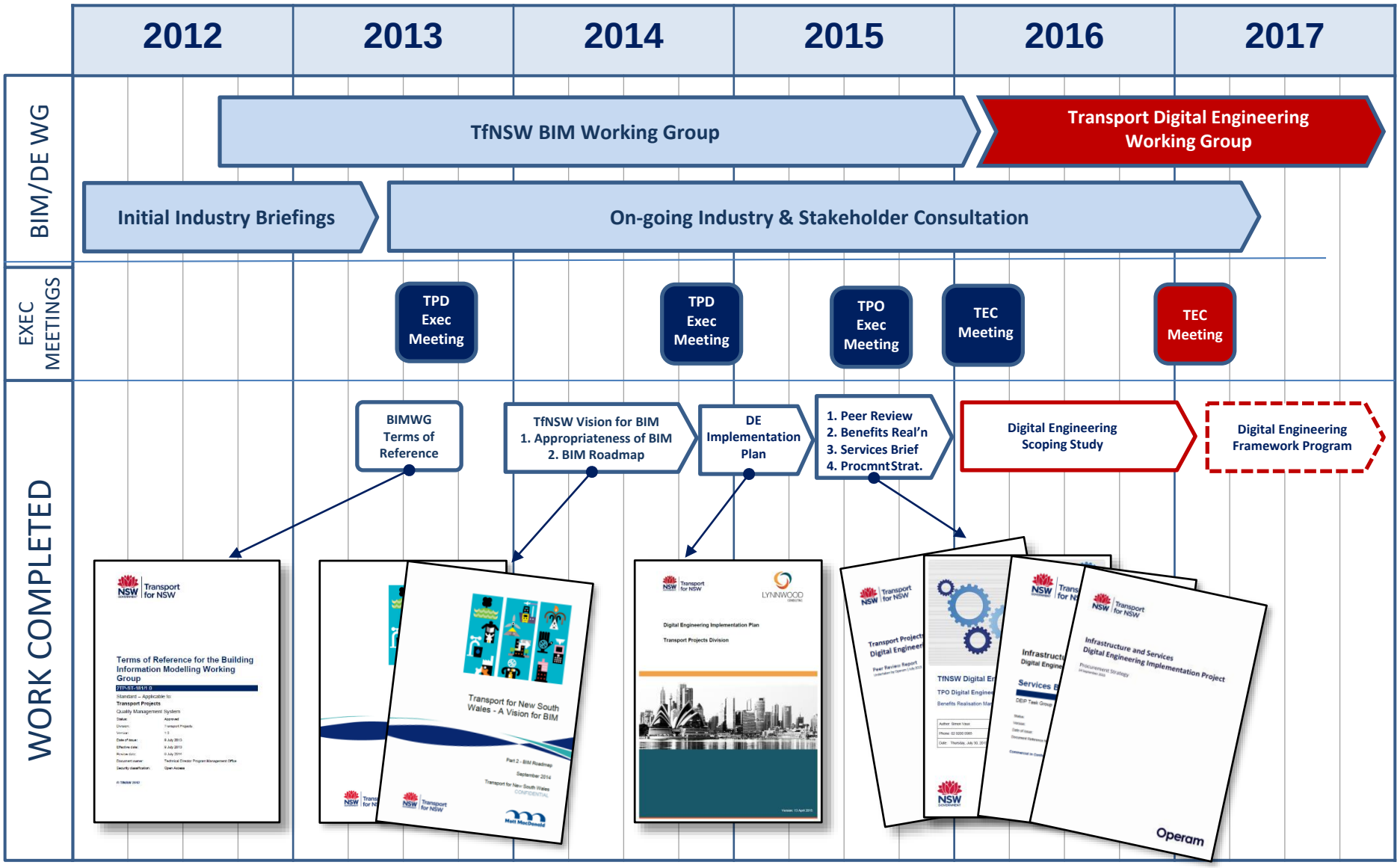
Emerging Risk

- Developments occurring independently
- Growing ad-hoc, uncontrolled
- No clear direction from either public or private sectors
- Similar issues with GIS
- 2 options:
  - Do nothing, spend more later to fix
  - Spend money now, to harness benefits

Where we need to be

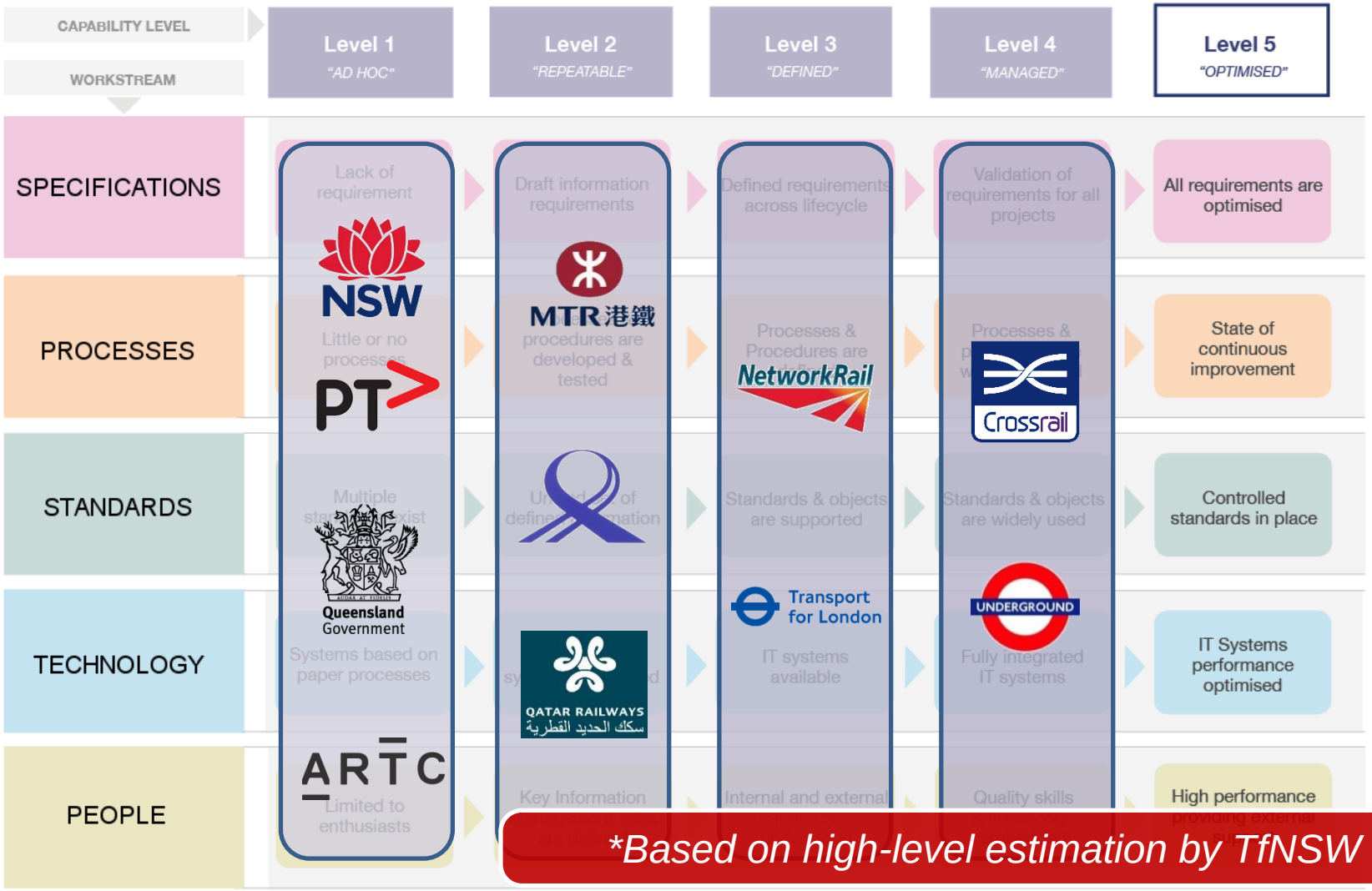
Mostly led by Contractors	→	Led by **Client**
Evolving contract req'mnts	→	Info req's defined in contract
Single purpose or phase	→	Multi-purpose or phase
Basic 3d model	→	Information Model
Deliverables in PDF and paper	→	Deliverables in **data**

Need for overarching strategy


2012
2013
2014
2015
2016
2017
BIM/DE WG
TfNSW BIM Working Group
Transport Digital Engineering Working Group
Initial Industry Briefings
On-going Industry & Stakeholder Consultation
EXEC MEETINGS
TPD Exec Meeting
TPD Exec Meeting
TPO Exec Meeting
TEC Meeting
TEC Meeting
WORK COMPLETED
BIMWG Terms of Reference
TfNSW Vision for BIM
1. Appropriateness of BIM
2. BIM Roadmap
DE Implementation Plan
1. Peer Review
2. Benefits Real'n
3. Services Brief
4. ProcmntStrat.
Digital Engineering Scoping Study
Digital Engineering Framework Program
Terms of Reference for the Building Information Modelling Working Group
Transport for New South Wales - A Vision for BIM
Digital Engineering Implementation Plan
Transport Projects Division
Infrastructure and Services Digital Engineering Implementation Project
Operam

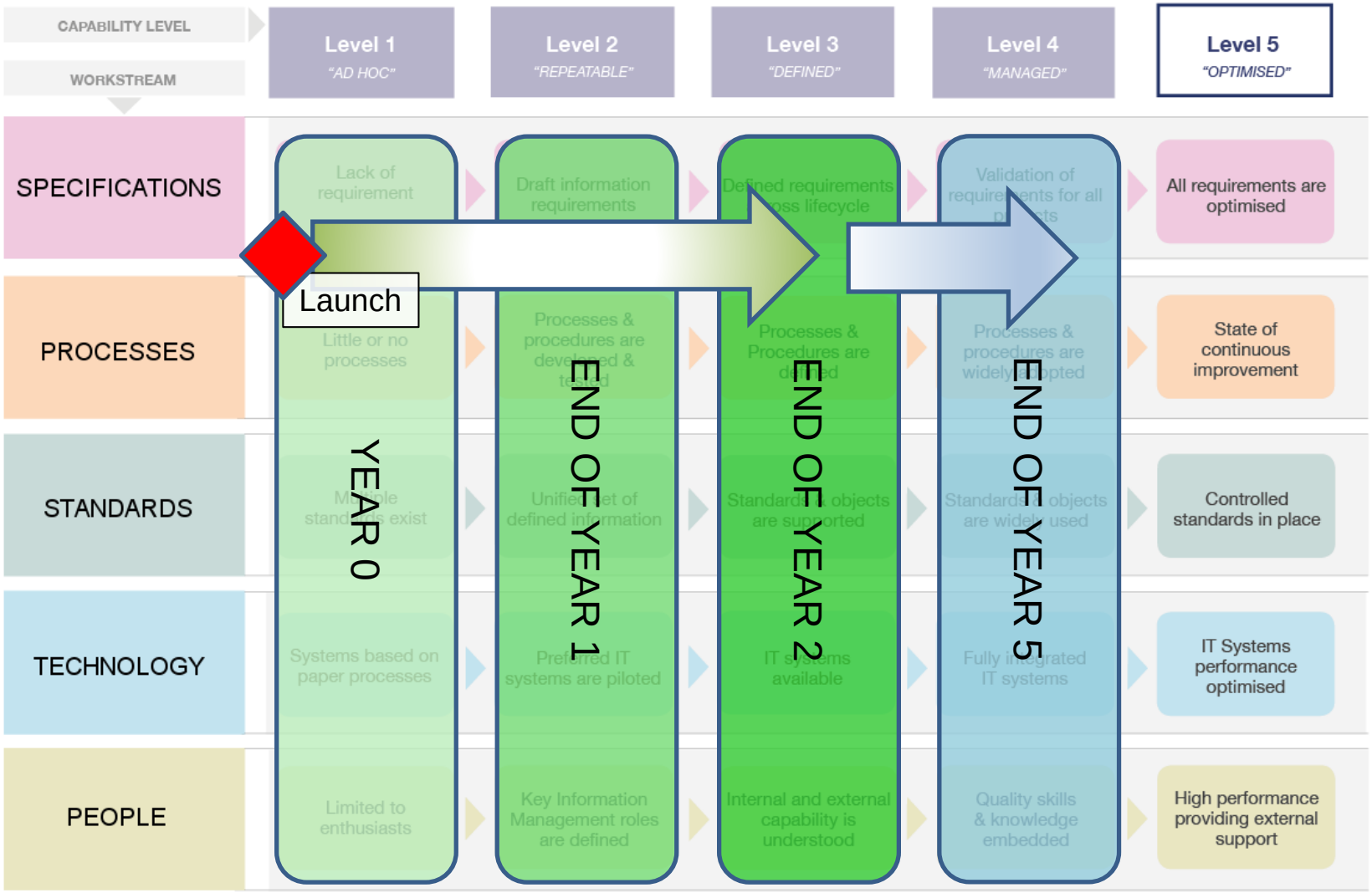
BIM Maturity Matrix

BIM Maturity Matrix

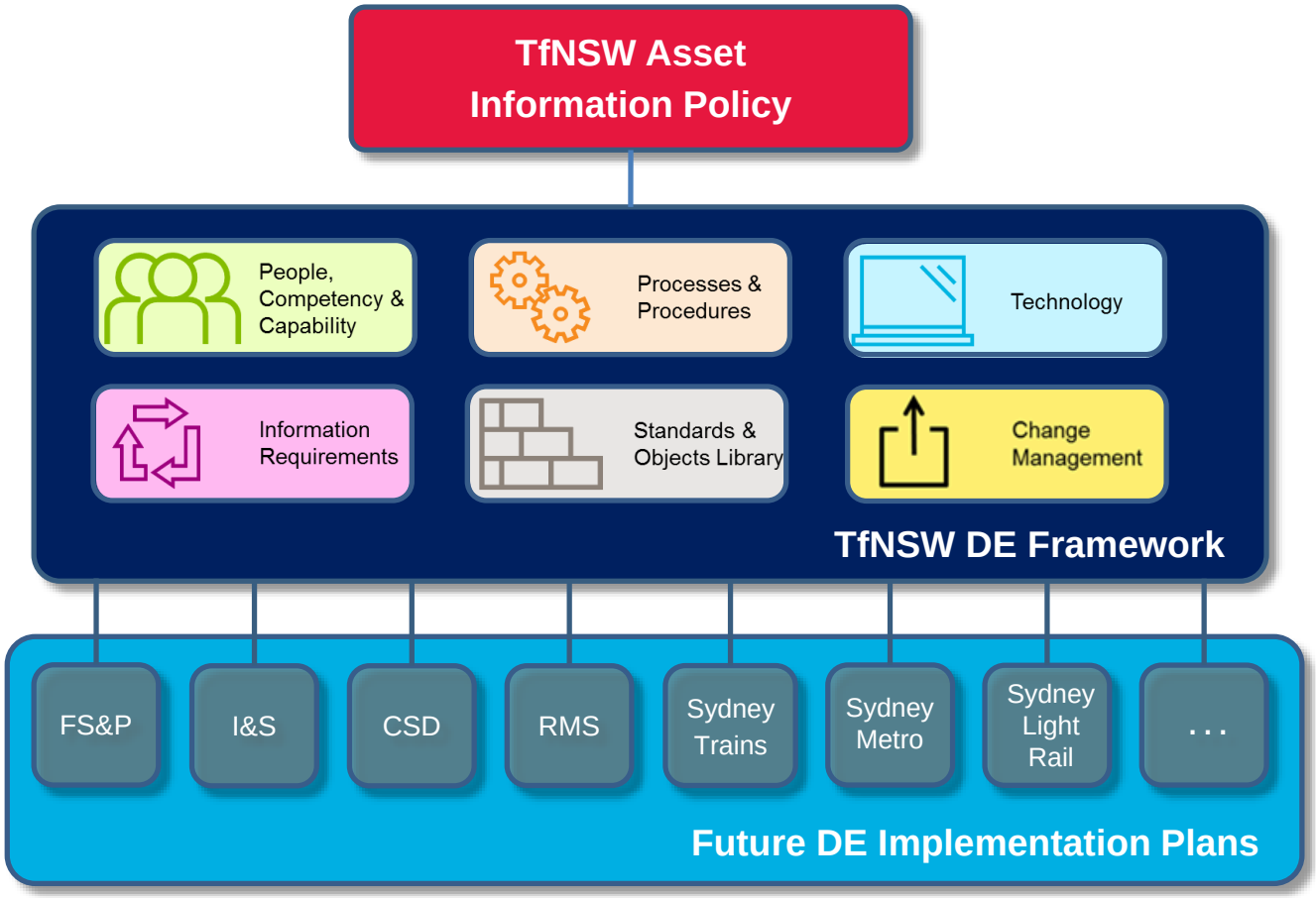


*Based on high-level estimation by TfNSW

BIM Roadmap Targets



TfNSW DE Framework



Digital Engineering Scoping Study

DE Baseline Report

Global Best Practice Report

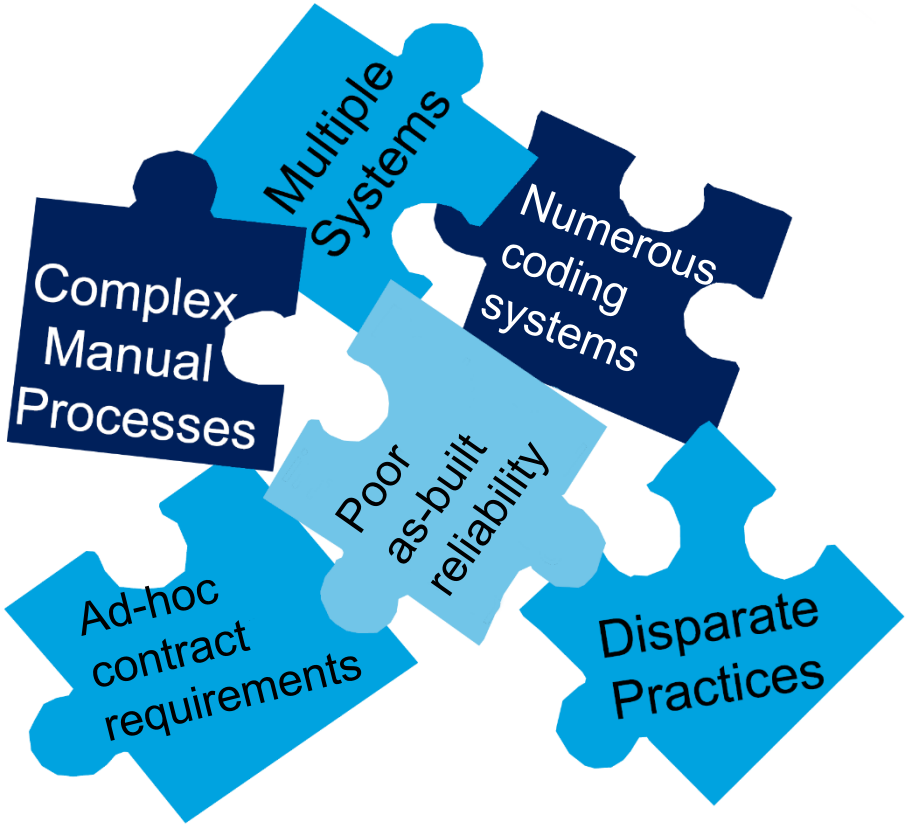
Asset Information Policy

Scoping Plan for DE Framework (incl. Conceptual Business case)

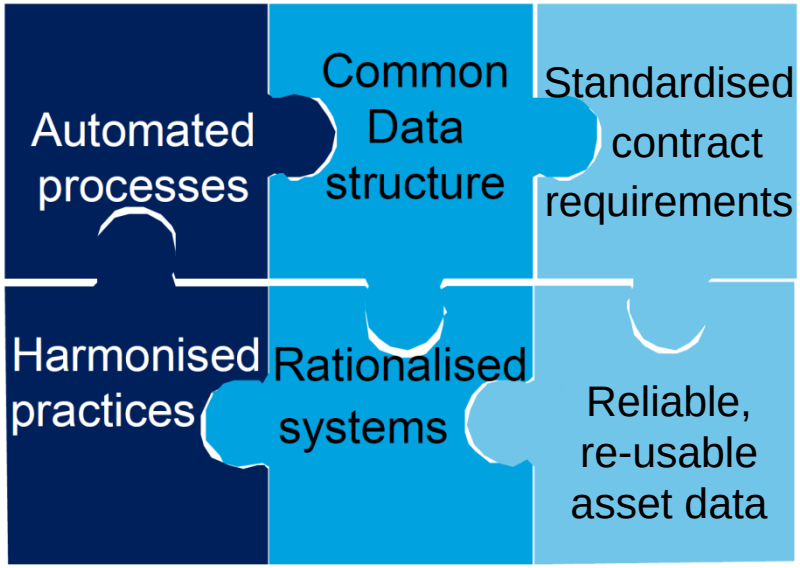
I&S DE Implementation Plan

Interim Project Controls

Initial Recommendations



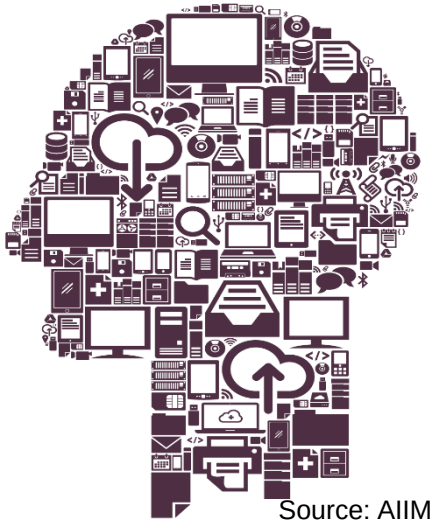
As-Is State



Future State

Asset Information Policy

"To enable individuals
responsible for delivering and managing a safe,
sustainable and integrated transport system,
to have the ***right asset information****,*
at ***the right time****,*
to make ***informed decisions****".*

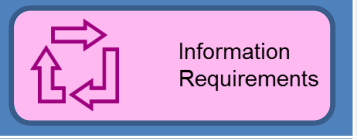
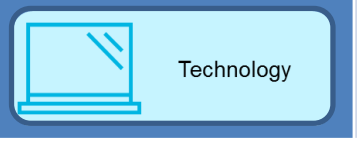


Source: AIIM

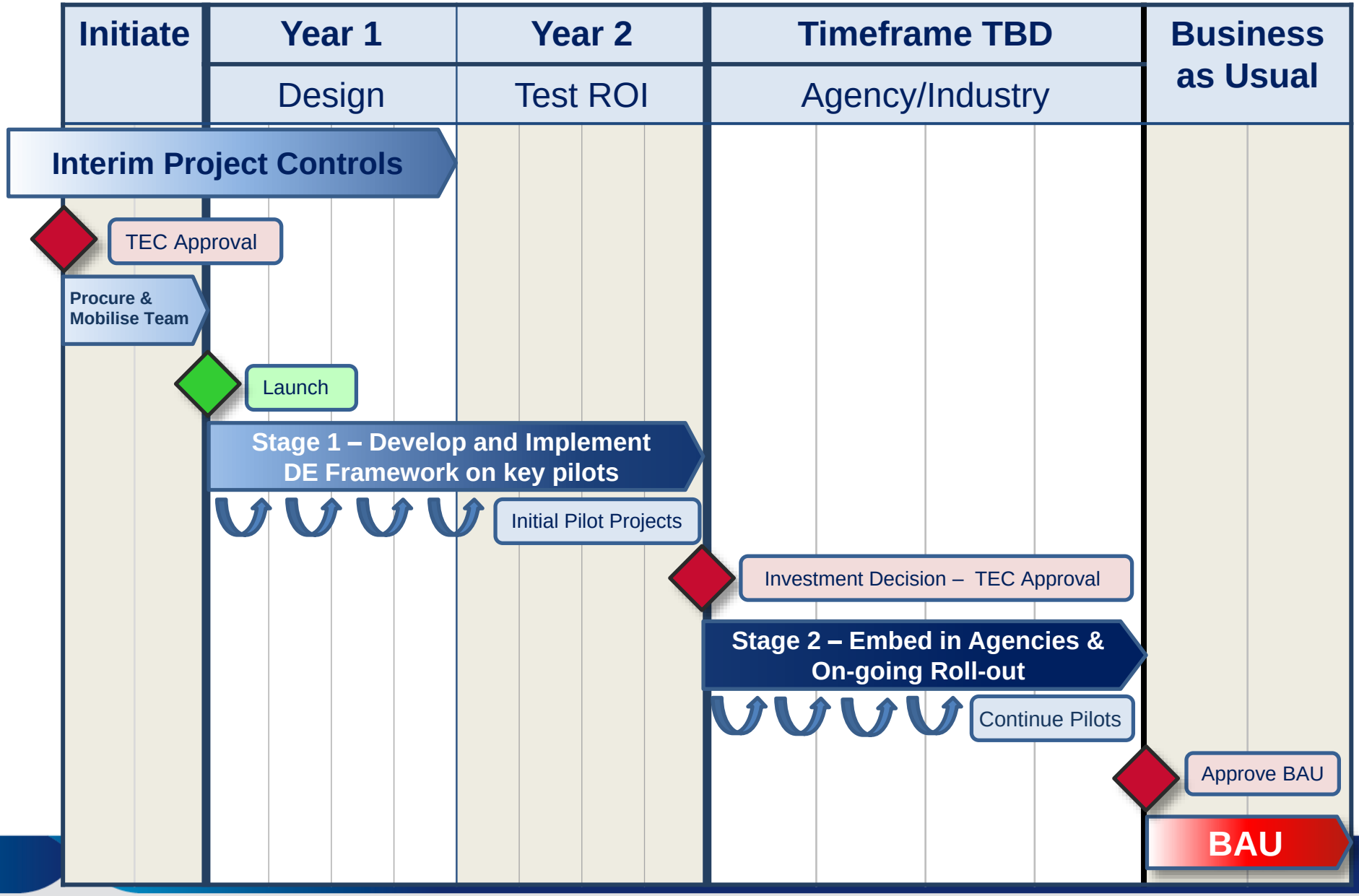
Asset Information Principles

Principle	Details
Single Source	Ensuring asset data is accurate, current, reliable and not duplicated
Collaboration	Increasing access and sharing, reducing latency for improved decision making
Automation	Reducing or eliminating manual work associated with creating or sharing data
Interoperability	Reducing or eliminating double handling or translation of data between systems
Mobility	Enabling access to and input of data from multiple locations including the field
Visualisation	Incorporating methods to develop, coordinate and check asset data spatially
Data Governance	Complying with information management policies, including open data, data custodianship & security

DE Workstreams

Workstream	Aims
	To develop education, training, assessment and change management programs, to enable DE competence and capability throughout Transport, O&Ms and the supply chain.
	To develop consistent client requirements for project and asset information for key decision points throughout the asset lifecycle.
	To develop consistent business procedures, that enable collaborative and automated information management processes throughout the asset lifecycle.
	To develop consistent data standards, that enable information to be interoperable, reliable and re-usable throughout the asset lifecycle.
	To leverage IT tools and systems, that support collaborative processes, to enable data to be mobile, visualised, accessible from primary sources of truth and integrated with the EAM and other enterprise systems.

DE Project


Initiate
Year 1
Year 2
Timeframe TBD
Business as Usual
Design
Test ROI
Agency/Industry
Interim Project Controls
TEC Approval
Procure & Mobilise Team
Launch
Stage 1 – Develop and Implement DE Framework on key pilots
Initial Pilot Projects
Investment Decision – TEC Approval
Stage 2 – Embed in Agencies & On-going Roll-out
Continue Pilots
Approve BAU
BAU

BCR (Stage 1)

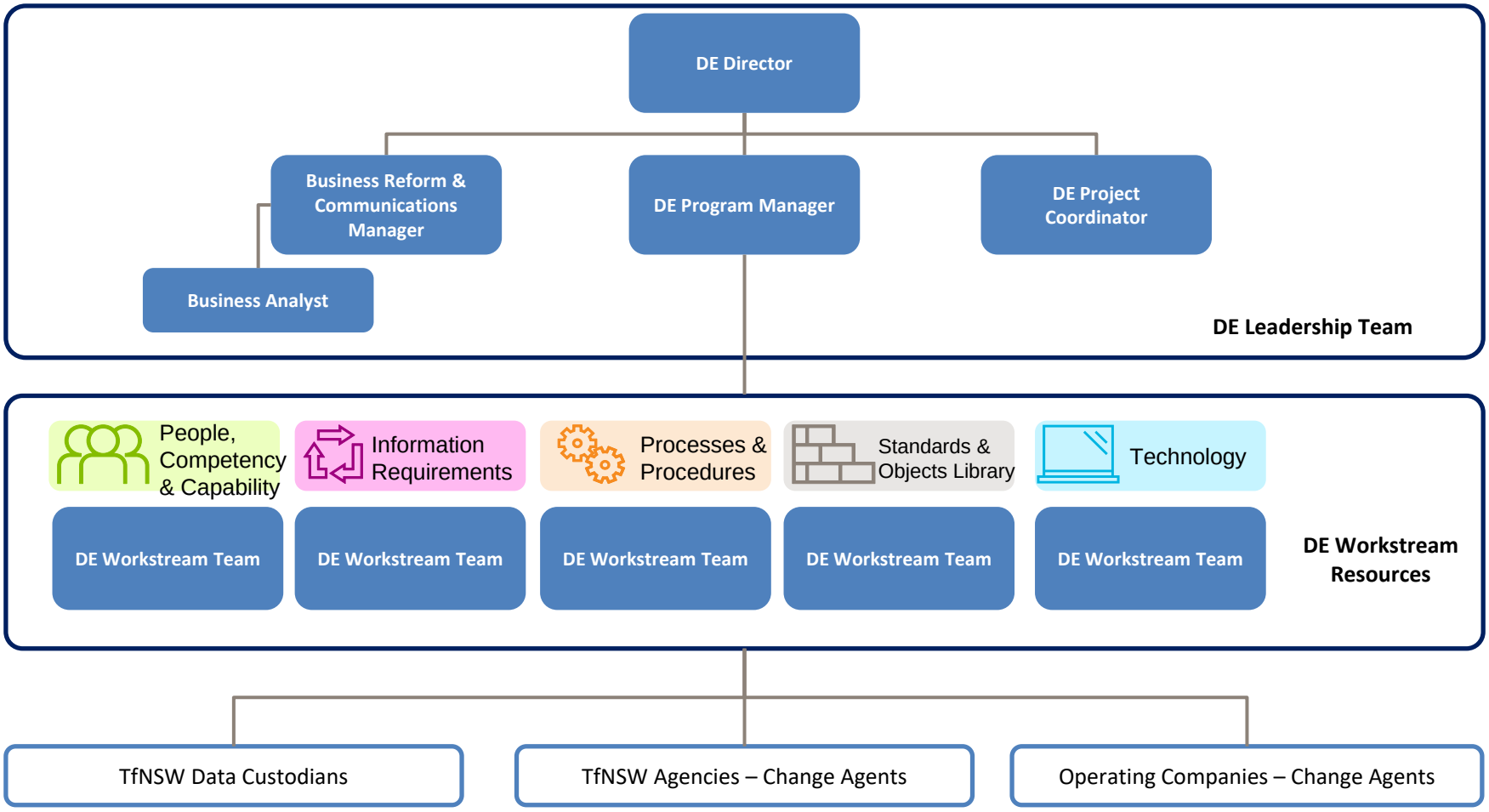
Item	At 1.7% (Project Case Study)	At 0.5% (Sensitivity Test)
Total Cost (Initiation & Stage 1)	$18M	$18M
Total Benefit	$228M	$69M
Net Benefit	$210M	$51M
Estimated BCR Stage 1	**12.7**	**3.8**

Note:

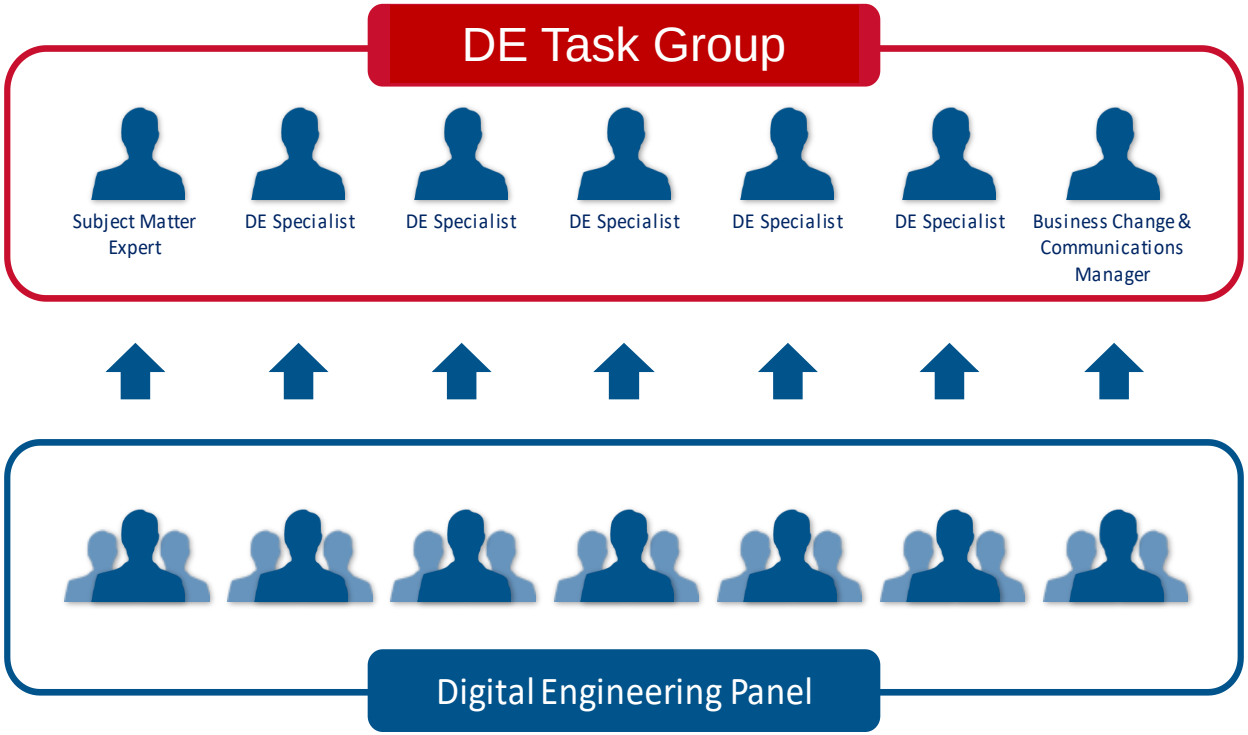
- BCR assumes 1.7% savings in Project Delivery phase only, based on documented lessons learned from the recent I&S project 'North Strathfield Rail Underpass' (NSRU) ($266M), where DE was **not** used.
- BCR is deemed to be relatively conservative as the benefits were limited to:
  - Cost avoidance rather than overall productivity improvements
  - Construction phase rather than the overall asset lifecycle
- Benefits assumed to be incremental, ramping up to 100% over the course of the DEF Project
- 0.5% Sensitivity test provided to give a lower-limit comparative estimate

DE Team (Stage 1)

- Team structure based on normative model
- Pending feedback from consultation and industry sounding



Procurement



Consultation

Stakeholders Consulted

Transport Personnel

No	Agency/ Division	Name	Role
1	ASA	Angelo Koutsoukos	Manager Asset Stewardship
2	ASA	Bob Bennett	Manager, Asset Performance Reporting
3	ASA	Lucio Favotto	Manager Asset Planning
4	ASA	Richard Fullalove	Manager Systems Engineering Process
5	ASA	Toby Horstead	PM Network and Asset Strategy
6	CPU	Christina Li	Senior Compliance and Access Officer
7	CPU	Donna Hayward	Principal Manager, Strategy and Privacy
8	CSD	Chris Bennetts	A/ED Digital Products and Services
9	CSD	Christian Wood	Program Director, Strategic Digital Projects
10	CSD	Jacinta Hargan	Director Future Transport Program
11	CSD	Rita Harding	A/ Deputy Secretary CSD
12	F&I	Stephen Fox	Executive Director, Finance
13	FSP	Gary McGregor	Acting Director, Strategic Rail Transport
14	FSP	Miranda Hall	Project Manager Infrastructure
15	FSP	Natalie Pelham	ED National Policy and Priority Initiative
16	FSP	Nathan Frick	Senior Analyst
17	FSP	Phil Bullock	A/Director Bureau of Statistics and Analytics
18	I&S - PD	Adam Griffiths	Project Controls Manager
19	I&S - PD	Simon Vaux	A/Principal Manager Engineering
20	I&S - PDMO	Craig Gillman	ED Program and Divisional Management Office
21	I&S - SD&P	David Spiteri	Director Infrastructure Management
22	IT	Annette Mathews	Principal Manager Solution Architecture
23	IT	Anton Schoeman	Business Solutions Architect
24	IT	Chris Lampard	Technical Analyst
25	IT	Darren Dadley	Principal Manager, Analytics and Reporting
26	IT	David Colquitt	Director IT Strategy and Architecture
27	IT	Manish Bhatia	Principal Manager BCSD
28	IT	Tim Catley	Group Chief Information Officer
29	NSW Trainlink	Anthony Martin	Technical Operations Manager
30	NSW Trainlink	Brian Sharp	EXEC Director Engineering & Seqr
31	NSW Trainlink	Michael Killeen	Asset Manager
32	Parra LR	Rick Everett	Data Planning Manager
33	RMS	Chris Harrison	Chief Engineer
34	RMS	Greg Evans	Director Asset Maintenance
35	RMS	Phillip Bird	Workstream Lead, Am Information
36	RMS	Stan Robb	Manager Road Policy Spec and Technology
37	STA	Michael Kammoun	Mgr OPS Infrastructure
38	Sydney Light Rail	David Dalton	Director Engineering
39	Sydney Metro	Inggrid Ajani	Manager Operations and Assets
40	Sydney Metro	Oliver Fried	Director Metro Product
41	Sydney Metro	Steve Myers	Senior Technical Services Manager (Southwest)
42	Sydney Trains	Grant Burton	GM Asset Management
43	Sydney Trains	Stewart Mills	Director Maintenance

Supply Chain

No	Organisation	Name	Role
Consultants			
1	AECOM	Steve Appleby	BIM Practice Lead, Australia and New Zealand
2	Arcadis	Richard Russell	Principal Engineer
3	Arup	Ricci Piper	Senior Project Manager & Strategy Consultant
4	Aurecon	Gavin Cotterill	Digital Advisory Leader
5	Beca	Craig Lamont	BIIM Lead Sydney
6	Cardno Group	Brenton Yewdall	
7	Engenicom	Josh Hartcher	Project Manager
8	GHD	Eric Bugeja	Principal Engineer - Digital Delivery
9	Jacobs	Ian Hardcastle	Technical Director, Digital Engineering
10	Meinhardt	Ken Douglas-Hill	
11	Mott MacDonald	Lachlan Daniel	Rail Practice Leader
12	MWH	Jason Walmsley	National Rail Infrastructure Team Leader
13	Opus	Daniel Jurgens	Global BIM Leader
14	Parsons Brinckerhoff	Richard Boggon	General Manager, Transport Services
15	SMEC	Mark Hatton	Manager, Technical and Professional Services
16	Urban Circus	Ben Guy	Digital Planning
Contractors			
17	Arenco	Stuart Owen	Design Manager
18	AW Edwards	David Oliver	Design Manager
19	Bouygues Construction Australia	David Mares	Survey Manager
20	CIMIC	Andrew Hannell	Senior BIM Engineer
21	Degnan Constructions	Freddie Lazar	
22	Downer	David Jones	Design Manager
23	Edwards Construction	Kim Cross	
24	EIC Activities	Anthony Butler	Manager - Digital Engineering
25	Gartner Rose	Daniel Rose	Managing Director
26	Haslin Constructions	Claudio Garrido	
27	John Holland	Donald Cameron	Manager IPD & BIM Systems
28	Laing O'Rourke	Stuart Bull	Lead for Digital Engineering Australian Hub
29	Lend Lease	Chris Canham	Operations Manager, Design
30	McConnell Dowell	Vito Trantino	
31	Pacific Complete	Christopher Wilkinson	Project Director
32	Stephen Edwards Constructions	Warwick Spencer	Business Development Manager
33	Thiess	Kevin Pan	BIM Application Manager

Other initiatives

- TfNSW DE Working Group
- Asset Management Framework
- Enterprise Asset Management
- Asset Information Standards
- Agency Asset Information Strategies
- Open Data Hub
- Future Transport

Transport for NSW

- NSW DE Working Group
- Other NSW Agencies (NSW HI, Education, Justice etc)
- Data governance policies (Open Data, Custodianship, Spatial, Security etc)

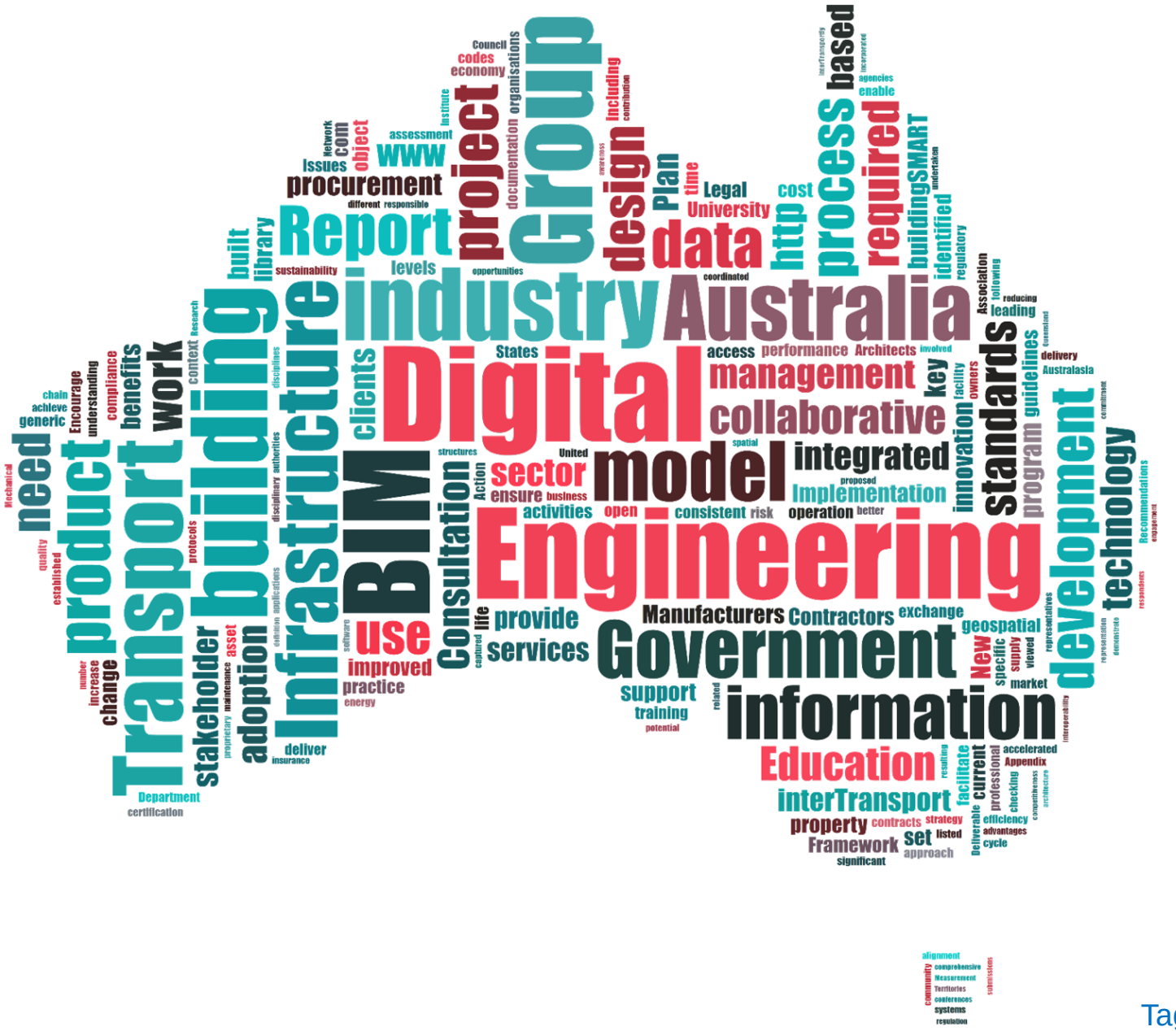
State of NSW

- National DE Working Group
- National DE Policy Principles (pending)
- Commonwealth agency recommendations (Smart ICT, IA etc)
- Jurisdictional strategies (Qld, Vic etc)

National

- UK Standards (BS/PAS 1192)
- ISO Standards (12006-2, 19650 etc)
- Asset Classification Standards (Uniclass, Omniclass etc)
- Open BIM & GIS Formats (IFC, InfraGML etc)
- BIM object libraries and standards

Global


Engineering
Government
information
Digital
industry
Australia
BIM
model
Group
Infrastructure
building
Transport
product
Report
project
design
data
process
required
standards
development
technology
Consultation
Education
interTransport
procurement
management
collaborative
integrated
sector
use
provide
services
Manufacturers
Contractors
exchange
geospatial
support
training
Implementation
innovation
program
guidelines
Framework
property
set
Department
certification
stakeholder
adoption
benefits
work
need
Encourage
understanding
compliance
generic
achieve
chain
Mechanical
quality
established
increase
change
number
asset
maintenance
proprietary
deliver
insurance
practice
energy
improved
Issues
Network
com
object
assessment
www
Council
codes
economy
organisations
documentation
Institute
including
contribution
awareness
Plan
time
Legal
University
cost
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building
SMART
identified
regulatory
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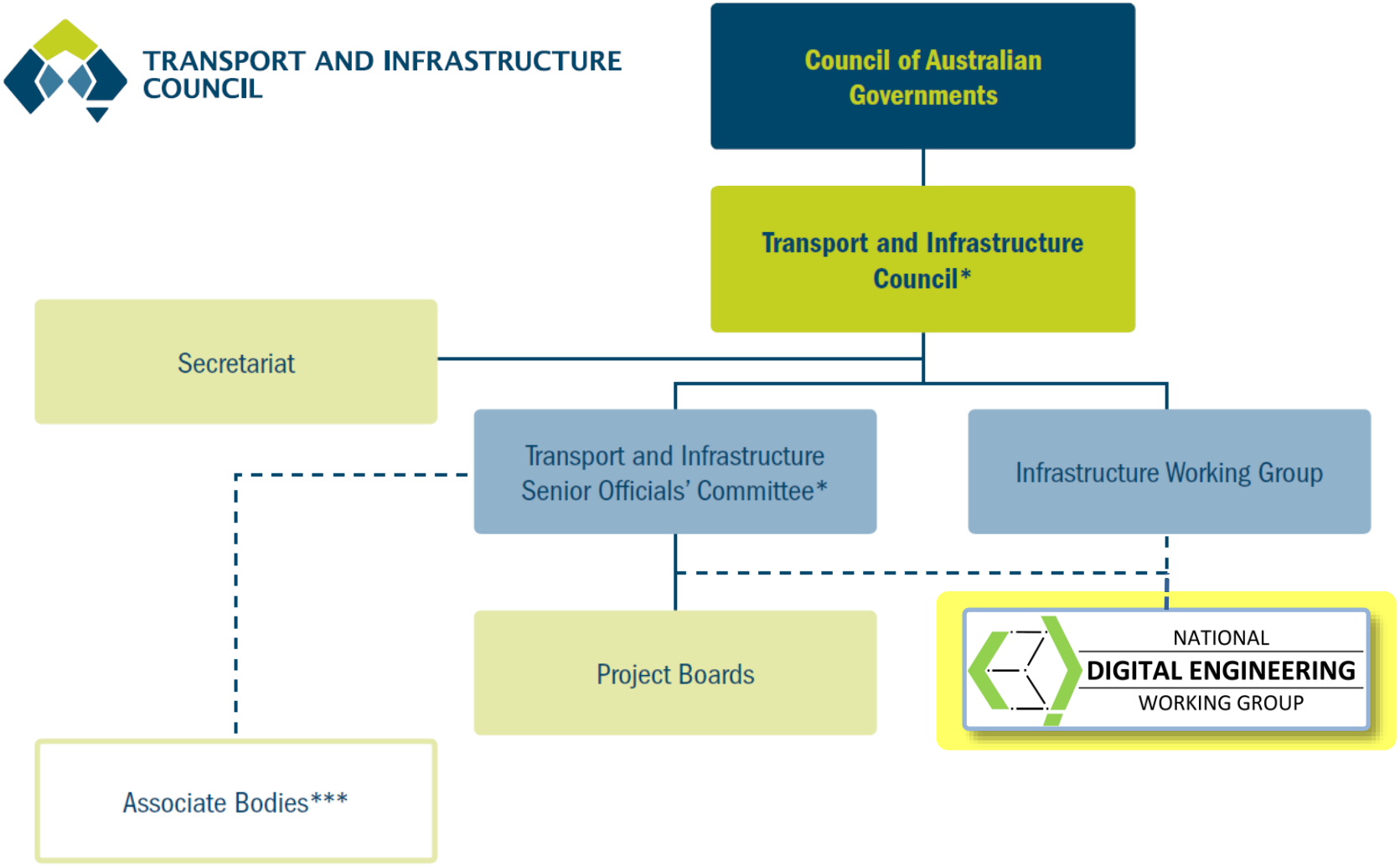
agencies
enable
based
interTransport
Association
following
reducing
leading
Australasia
delivery
Recommendations
engagement
representatives
representation
demonstrate
responders
interoperability
accelerated
Appendix
facilitate
current
professional
checking
compatibleness
architecture
efficiency
advantages
cycle
Deliverable
strategy
listed
approach
significant
contracts
set
Framework
alignment
comprehensive
Measurement
Territories
conferences
systems
regulation
community
submissions
built
library
sustainability
levels
opportunities
coordinated
States
access
performance
Architects
involved
key
facility
owners
clients
disciplines
context
Research
protocols
disciplinary authorities
structures
United
Action
ensure
business
activities
open
consistent
risk
operation
better
spatial
proposed
life
captured
software
Consultation
Manufacturers
Contractors
supply
viewed
New
specific
market
related
potential
Recommendations
Australasia
Queensland
Tagxedo.com

Local Initiatives

Government / Industry Body	Title	Year	Objective
Consult Australia & AIA	BIM In Practice Guides on Education, Legal & Plans	2012	• Upskill industry to improve understanding • Encourage BIM adoption
buildingSMART Australasia	National BIM Initiative Vol 1: Strategy	2012	• Recommends Australian BIM Mandate • Provides strategy for adoption of BIM in the Australian built environment sector
Productivity Commission	Inquiry Report into Public Infrastructure	2014	Recommends government clients to: • Develop a common set of BIM standards and protocols • Use BIM to improve procurement and reduce costs
NZ BIM Acceleration Committee	New Zealand BIM Handbook	2014	• Outline BIM uses and benefits, to drive change in local industry
Victorian Gov	• 2015-16 State Budget & • Construction Tech Strategy	2015 2016	• Undertake BIM pilots on buildings & infrastructure • Releasing a statement and formal plan in 2017
Australian Gov House of Reps	Inquiry into the role of Smart ICT in the design and planning of Infrastructure	2016	• Recommends BIM on all major infrastructure projects exceeding $50 million in cost
Infrastructure Australia	Australian Infrastructure Plan	2016	• Recommends BIM mandate and development of guidance, common standards and protocols
Queensland Gov Dept of Infrastructure	State Infrastructure Plan	2016	• Progressively implement the use of BIM into all major state infrastructure projects by 2023
TIC / IWG / DIRD	National DE Working Group	2016	• Develop national approach, data standards and harmonised guidelines to implement BIM

National DE Working Group



Working Group

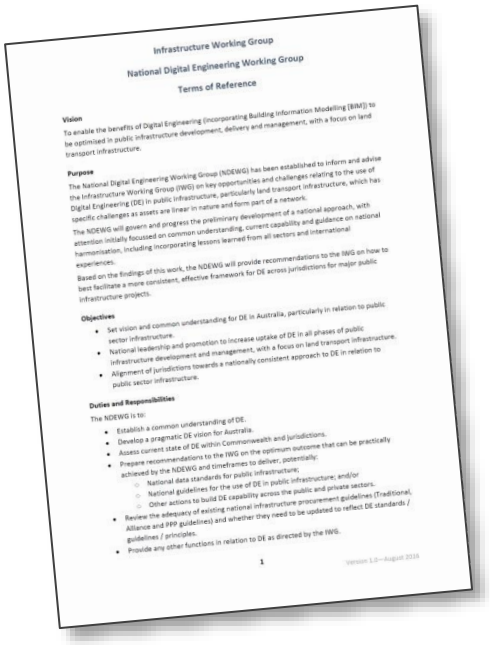
Vision

- *"To enable the benefits of Digital Engineering (incorporating Building Information Modelling [BIM]) to be optimised in public infrastructure development, delivery and management, with a focus on land transport infrastructure".*

Objectives

- National DE Policy
- National DE Framework, to promote greater uptake of DE
- Promote open data requirements for infrastructure assets
- Facilitate a more consistent harmonised approach
- Increase capacity and capability (public & private sectors)
- More info out soon..

Progress to-date



Infrastructure Working Group

National Digital Engineering Working Group

Terms of Reference

Vision

To enable the benefits of Digital Engineering (incorporating Building Information Modelling (BIM)) to be optimised in public infrastructure development, delivery and management, with a focus on land transport infrastructure.

Purpose

The National Digital Engineering Working Group (NDEWG) has been established to inform and advise the Infrastructure Working Group (IWG) on key opportunities and challenges relating to the use of Digital Engineering (DE) in public infrastructure, particularly land transport infrastructure, which has specific challenges as assets are linear in nature and form part of a network.

The NDEWG will govern and progress the preliminary development of a national approach, with attention initially focussed on common understanding, current capability and guidance on national harmonisation, including incorporating lessons learned from all sectors and international experiences.

Based on the findings of this work, the NDEWG will provide recommendations to the IWG on how to best facilitate a more consistent, effective framework for DE across jurisdictions for major public infrastructure projects.

Objectives

- Set vision and common understanding for DE in Australia, particularly in relation to public sector infrastructure.
- National leadership and promotion to increase uptake of DE in all phases of public infrastructure development and management, with a focus on land transport infrastructure.
- Alignment of jurisdictions towards a nationally consistent approach to DE in relation to public sector infrastructure.

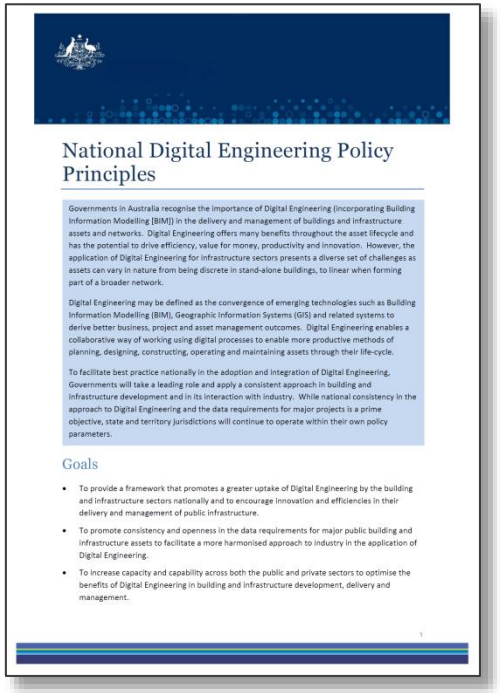
Duties and Responsibilities

The NDEWG is to:

- Establish a common understanding of DE.
- Develop a pragmatic DE vision for Australia.
- Assess current state of DE within Commonwealth and jurisdictions.
- Prepare recommendations to the IWG on the optimum outcome that can be practically achieved by the NDEWG and timeframes to deliver, potentially:
  - National data standards for public infrastructure; and/or
  - National guidelines for the use of DE in public infrastructure and private sectors.
  - Other actions to build DE capability across the public and private sectors.
- Review the adequacy of existing national infrastructure procurement guidelines (Traditional, Alliance and PPP guidelines) and whether they need to be updated to reflect DE standards / guidelines / principles.
- Provide any other functions in relation to DE as directed by the IWG.

1 Version 1.0—August 2016

Working Group
Terms of Reference



National Digital Engineering Policy Principles

Governments in Australia recognise the importance of Digital Engineering (incorporating Building Information Modelling (BIM)) in the delivery and management of buildings and infrastructure assets and networks. Digital Engineering offers many benefits throughout the asset lifecycle and has the potential to drive efficiency, value for money, productivity and innovation. However, the application of Digital Engineering for infrastructure sectors presents a diverse set of challenges as assets can vary in nature from being discrete in stand-alone buildings, to linear when forming part of a broader network.

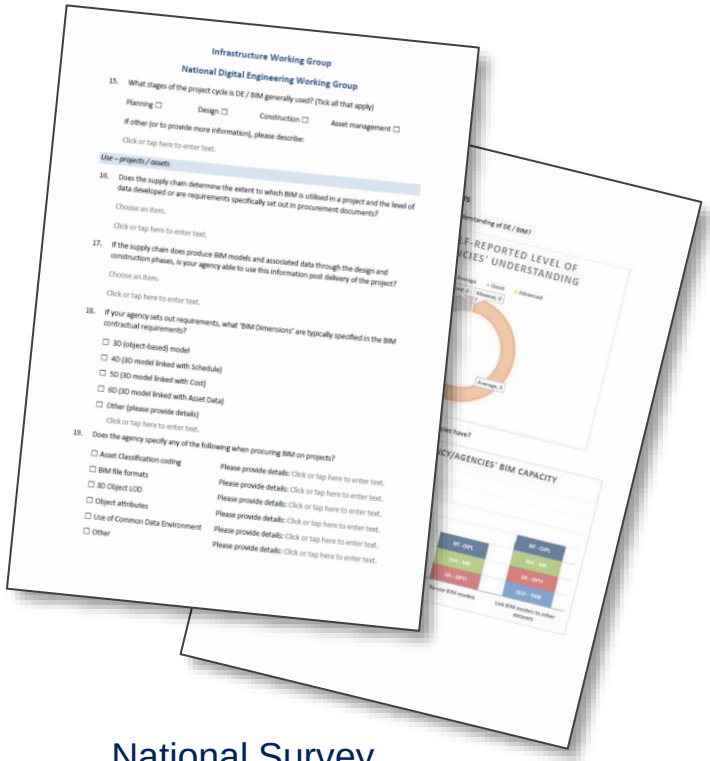
Digital Engineering may be defined as the convergence of emerging technologies such as Building Information Modelling (BIM), Geographic Information Systems (GIS) and related systems to derive better business, project and asset management outcomes. Digital Engineering enables a collaborative way of working using digital processes to enable more productive methods of planning, designing, constructing, operating and maintaining assets through their life-cycle.

To facilitate best practice nationally in the adoption and integration of Digital Engineering, Governments will take a leading role and apply a consistent approach in building and infrastructure development and in its interaction with industry. While national consistency in the approach to Digital Engineering and the data requirements for major projects is a prime objective, state and territory jurisdictions will continue to operate within their own policy parameters.

Goals

- To provide a framework that promotes a greater uptake of Digital Engineering by the building and infrastructure sectors nationally and to encourage innovation and efficiencies in their delivery and management of public infrastructure.
- To promote consistency and openness in the data requirements for major public building and infrastructure assets to facilitate a more harmonised approach to industry in the application of Digital Engineering.
- To increase capacity and capability across both the public and private sectors to optimise the benefits of Digital Engineering in building and infrastructure development, delivery and management.

National Policy
(Approved 4th Nov 2016)



Infrastructure Working Group

National Digital Engineering Working Group

15. What stages of the project cycle is DE / BIM generally used? (Tick all that apply)

Planning ☐ Design ☐ Construction ☐ Asset management ☐

If other (or to provide more information), please describe:

Click or tap here to enter text.

Use – projects / assets

16. Does the supply chain determine the extent to which BIM is utilised in a project and the level of data developed or are requirements specifically set out in procurement documents?

Choose an item.

Click or tap here to enter text.

17. If the supply chain does produce BIM models and associated data through the design and construction phases, is your agency able to use this information post delivery of the project?

Choose an item.

Click or tap here to enter text.

18. If your agency sets out requirements, what 'BIM Dimensions' are typically specified in the BIM contractual requirements?

- ☐ 3D (object-based) model
- ☐ 4D (3D model linked with Schedule)
- ☐ 5D (3D model linked with Cost)
- ☐ 6D (3D model linked with Asset Data)
- ☐ Other (please provide details)

Click or tap here to enter text.

19. Does the agency specify any of the following when procuring BIM on projects?

- ☐ Asset Classification coding — Please provide details: Click or tap here to enter text.
- ☐ BIM file formats — Please provide details: Click or tap here to enter text.
- ☐ 3D Object LOD — Please provide details: Click or tap here to enter text.
- ☐ Object attributes — Please provide details: Click or tap here to enter text.
- ☐ Use of Common Data Environment — Please provide details: Click or tap here to enter text.
- ☐ Other — Please provide details: Click or tap here to enter text.

National Survey

Lessons Learned

Lesson	Details
1. Not just an IT project	• New technology alone won't achieve results. This is more about organisational change. • IT is an important element, however DE must be led from within the business
2. Appoint a sponsor	• Someone with appropriate seniority, who gets it and owns it • Possibly from numerous business groups e.g. PMO, Technical, Asset Mgmt etc
3. Appoint a champion	• Someone in-house (to retain knowledge) with dedicated capacity & understands agency • Someone who can wear numerous hats e.g. strategic, technical, political, comms, sales etc
4. Effective working group	• Attract diverse membership from across key business units/projects • Not just interest group. Must have senior level membership and buy-in
5. Need a vision	• To align the group, shape the direction and set the objectives
6. Consult, consult, consult!	• Map the current landscape and new initiatives/interfaces, and • Educate other parties and engage them along the journey

Lessons Learned (..continued)

Lesson	Details
7. This is a journey	• Group won't have all the answers straight away • Business change is complex, with many feedback loops and "unknown unknowns"
8. Develop a staged approach	• Develop long-term strategy with key milestones/ assurance gates • Also address immediate issues e.g. consistent procurement of basic deliverables
9. Seek advice	• Seek out case-studies to identify best practice and pockets of excellence • Consult with your supply chain to understand current capability, strengths, future plans etc
10. Industry specialists	• "BIM Managers" don't have all the answers. Check their background e.g CAD, architects etc • BIM solutions for vertical buildings currently don't necessarily apply to linear infrastructure • Need consultants who have a blend of technical understanding and 'business acumen'
11. Global innovation	• Global industry is developing at a rapid pace • Be aware of emerging innovations, e.g. standards, technologies, work practices etc
12. Create sense of urgency	• Industry is seeking leadership from government clients. Now is the time to act! • *See HBR paper: "Leading Change - Why Transformation Efforts Fail" by JP Kotter (1995)*

Emerging Technologies

For more reading, check out:

http://bit.ly/BIMlibrary

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Chair, National DE Working Group
e: simon.vaux@transport.nsw.gov.au