## **Network Digital Engineering**

David Darwin, Lead Advisor Investment Planning, Waka Kotahi NZ Transports Gency



New Zealand Government

# Digitisation is changing the way we can and should do business

- Supports the creation of a value chain that is connected, collaborative and efficient
- Share and reuse data and collective insight
- Allows for one source of truth in federated information systems between all key players across the asset based service life cycle
- Share and use common data across the supply chain and between partners
- Ensures that the right information is supplied to the right people at the right time to enable better decision making
- Insight and decision quality, not sourcing and recreating data





#### Technology is changing our Transport environment



## Disruptive technologies

- Smart phones and Smart Cities
- Internet-of-things ... low cost sensors
- 5G ... remote working
- Big data
- Web based applications ... Software as a service
- Artificial Intelligence
- Real-time travel information
- Multimodal assets
- Mobility as a Service





### **Change is coming**

- Change is underway
- BIM is routinely used overseas, and on vertical build projects in NZ
- Conventional software applications are becoming more capable
- Not if and when our choice is how and when we adopt emerging technologies
- Clients must set and adopt industry standards to maximise public benefit.





#### Why does digitisation matter

- Construction sector's output growth has been driven by longer hours despite decline of productivity of resources
- Transport costs have been static, networks have grown in size and complexity, while service levels have increased
- We can improve the value for money of the transport services we provide
- 3-10% of lifecycle costs, of \$2.5b improvements, \$2.5b maintenance pa through NLTP
- Add value by implementing the right activity in the right place at the right time in the right way



NZ BIM Acceleration Committee: "BIM is a game-changer. Few things have the potential to improve the performance of New Zealand's building, construction and asset operation sectors as Building Information Modelling (BIM). BIM is the only improvement initiative likely to deliver a step-change, rather than an incremental gain in productivity."



#### **BIM and Digital Engineering – what is in a name**

- BIM is the digital representation of physical and functional characteristics of a building, piece of physical infrastructure or environment. BIM serves as a shared knowledge resource for information about an asset throughout its lifecycle - supporting decision making - from strategic appraisal and planning, design and construction to operation, maintenance and renewal.
- Digital Engineering is the collaborative way of working using digital processes to enable more productive methods of planning, designing, constructing, operating and maintaining assets throughout their lifecycle.
- A digital twin is a dynamic digital representation of a real asset or system that is used to collect, understand, predict and optimise performance.
- Activity and asset management are the delivery of community outcomes and customer services using data driven decisions to deliver public value





#### What is in it for me





#### How might network management change

Political Economic Social Technological Legal Environmental Context

Transport system Connected networks and services Impacts and outcomes Service expectations Demand Requirements Engagement Investment Change targets Productivity





#### How might network management change with digitisation





#### How might network management change





#### What types of information are involved





#### What information systems are involved

Project Information Model	BIM CDE	imercial rements	unication	ule	ement	agement	ient		Tasks				Benefit realisation
Maintenance Model	et int stem	Cor requ	comn	Scheo	mana	s man	nager	et date	vities	tion		cess	<b>୪</b> ୩
Activity Managemen Information Model	Spatial as: managem information s		Engagement	Time -	Document	Requiremen	Risk M	Ass	Proposal Act	Asset cond	Demanc	Customer ac and use	Service performanc impact



#### **Digital Asset Lifecycle – golden thread of information**

#### **Project information:**

- From many datasets
- · From many activities
- From many sources
- Across many projects
- At various lifecycle stages
- Using various lifecycle models



All feeding into the **'Digital Asset Lifecycle'**, enabled by:

- Common data standards
- Detailed specifications
- Consistent processes
- Consistent asset lifecycle



#### **A DE framework**

#### • Build on others experience e.g. KiwiRail, LGWM, TfNSW

In the context of Digital Engineering, a DE Framework may include the following components:

Policy	Principles			ВІМ		
	Formal Policy		Deliverables	CAD, GIS, Documents		
	BIM & CDE			Project Controls (Schedule, Cost, Reqs, Risk etc)		
Definitions			Technology	Suggests Software		
	Explains & differentiates DE		reciniology	Detailed Software Configuration		
Process	CDE Processes		Deeple	Defines roles		
	Detailed Asset Lifecycle		People	Comprehensive staff training		
Procurement	PAS 1192 IM templates (OIR, AIR, EIR, BEP, LOD)			File naming conventions		
	Defined been also inforce universate (OID, AID, FID, BED, LOD)		Data	Nominates classification (e.g. Uniclass)		
	Defined bespoke into requirements (OIK, AIK, EIK, BEP, LOD)		Data	Data Schema for BIM Objects		
	Full contract integration			Data schemas for all deliverables		



#### **Next steps**

- Learn from others
- Data Standard to make sharing easy, remove cost, and apply insight everywhere
  - System agnostic information systems and apps are a commercial choice
  - Client led public value
- Develop and engage on data standard; pilot and launch
  - Using sector SMEs
  - Working with partners
  - Engaging with system vendors
- Working with KiwiRail and LGWM

