

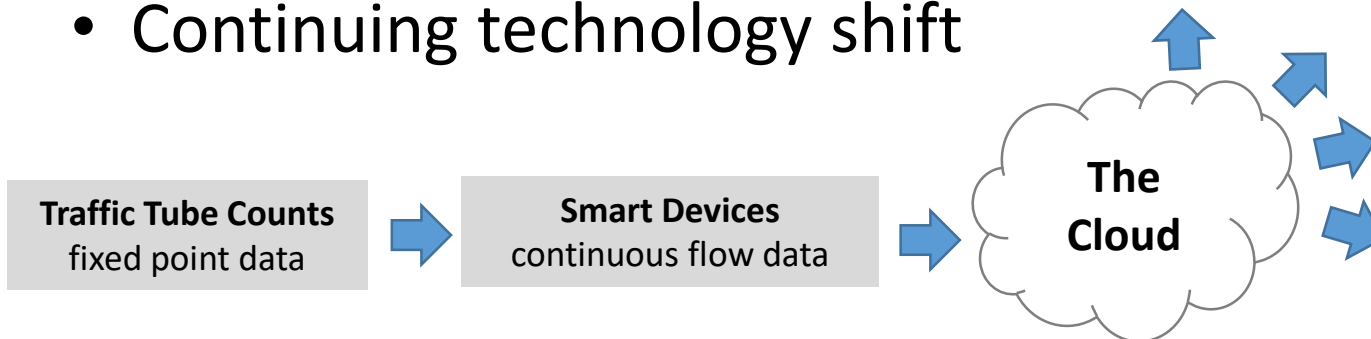


Transportation Big Data Analytics

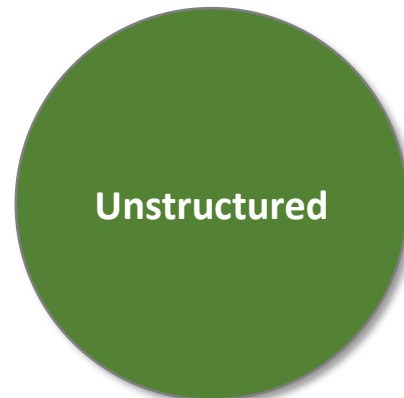
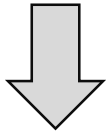
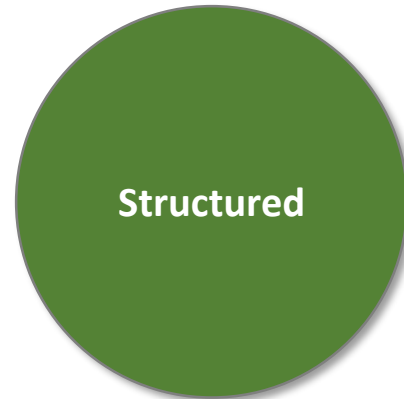
Tim Cross, Opus International Consultants

Big Data Reality

- Data supply and demand rising!
- New providers/services in the market
- Education gap –
People want the value from IT and data (Big Data),
challenge to bridge knowledge gaps
- Continuing technology shift



Big Data Reality



Core Transport Domain Data

“what we know”, controlled,
designed fit-for-purpose

- Asset Registers
- Asset Use Sensors
- Incident, Safety Records
- Licensing, Registration

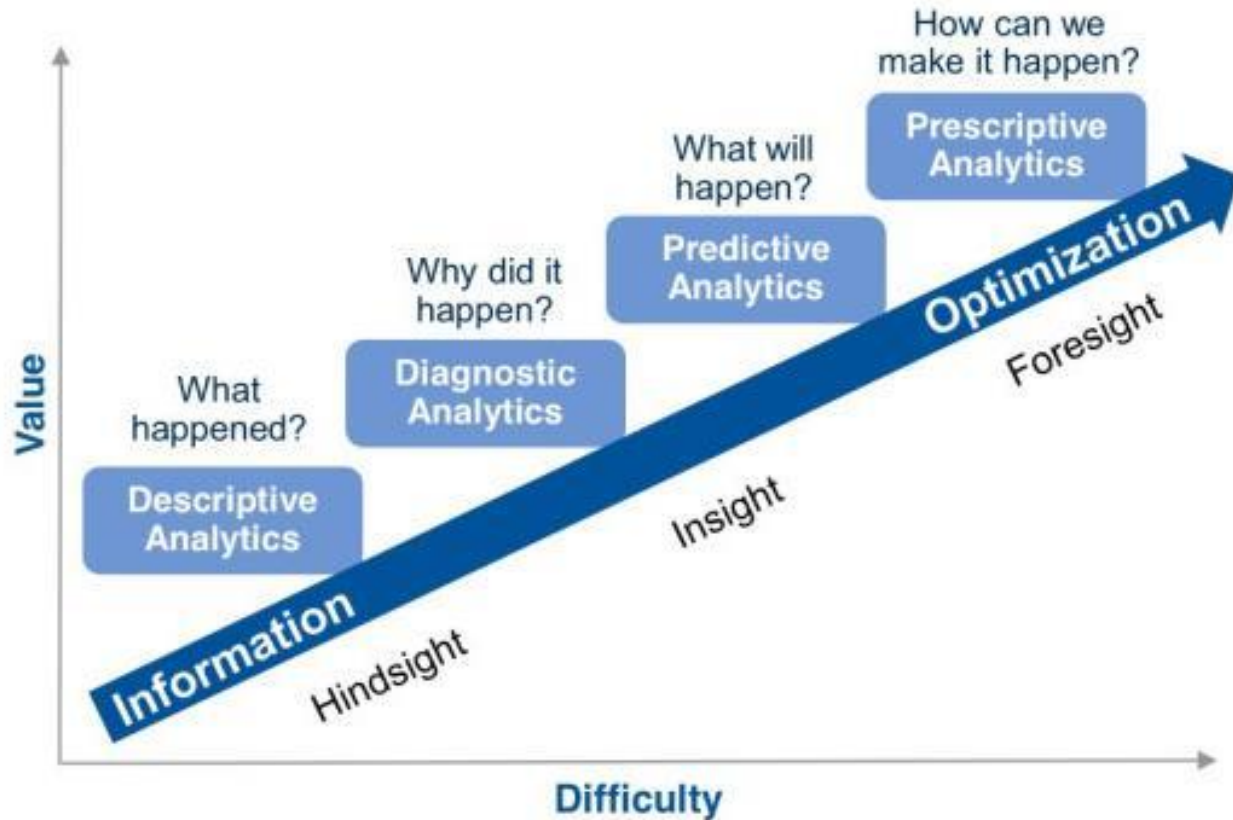
Supplementary Transport Domain Data

often “what we don’t know”,
associated, relatable,
adjusted-for-purpose

- Social, Behavioural
- Economics
- New Technologies
- Environment, Weather

Reliability??

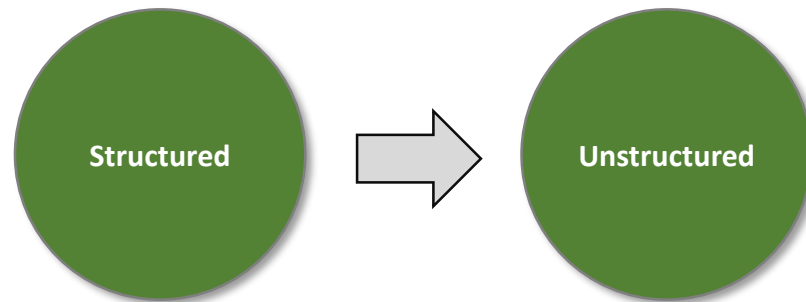
Analytics Journey



Ref: <http://www.rosebt.com/blog/descriptive-diagnostic-predictive-prescriptive-analytics>

Big Data Value Proposition

- We venture into the unknown, at high risk, high reward (“big data mining”)
- This is a discovery activity, where we could succeed



- Be thoughtful, cautious and pragmatic with trends and signals

Waterview Connection, AMA, Power BI

- Focused principally on linking structured datasets:
 - Travel Time
 - Traffic Volume
 - Asset Capacity
- Use of agile traffic models of Auckland Motorways
- Real-time analysis of the network demonstrating impacts of the Waterview Connection (including the business case)

Waterview Connection, AMA, Power BI

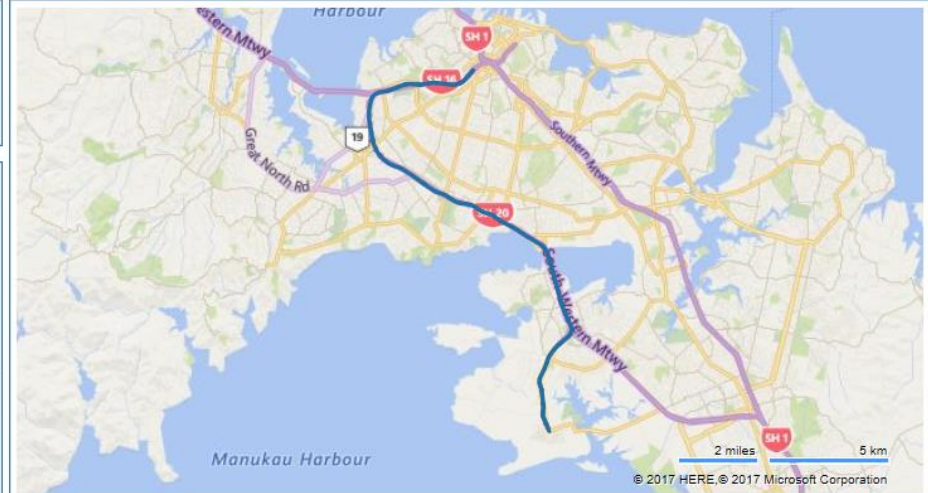


Auckland Motorways

Route

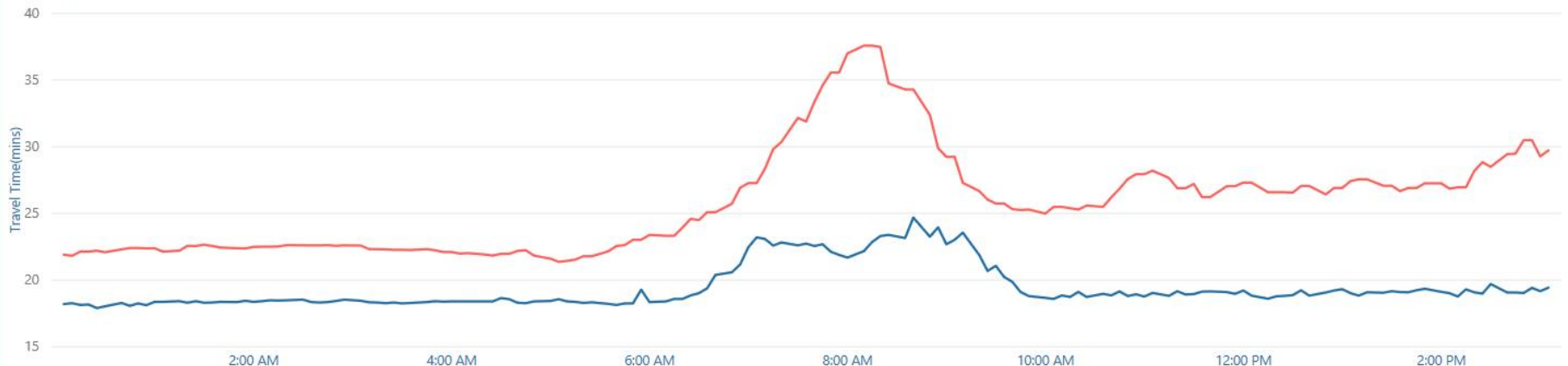
Airport - CBD Motorway via Waterview

Route	Current	Baseline	Difference
Airport - CBD Motorway via Waterview	19.43	29.72	-10.28
Airport - CBD via Manukau Rd and Gillies Ave	27.10	29.72	-2.62
CBD - Airport Motorway via Waterview	18.83	25.78	-6.95
CBD - Airport via Manukau Rd and Gillies Ave	23.05	25.78	-2.73
CBD - Silverdale	20.18	19.90	0.28
CBD - Westgate	13.48	12.78	0.70
Penrose - Port via SH1	15.27	0.00	15.27
Penrose - Port via SH16/SH20	22.50	0.00	22.50
Port - Penrose via SH1	16.02	0.00	16.02
Port - Penrose via SH16/SH20	20.72	0.00	20.72
SH1 (CBD - Papakura)	24.95	25.73	-0.78

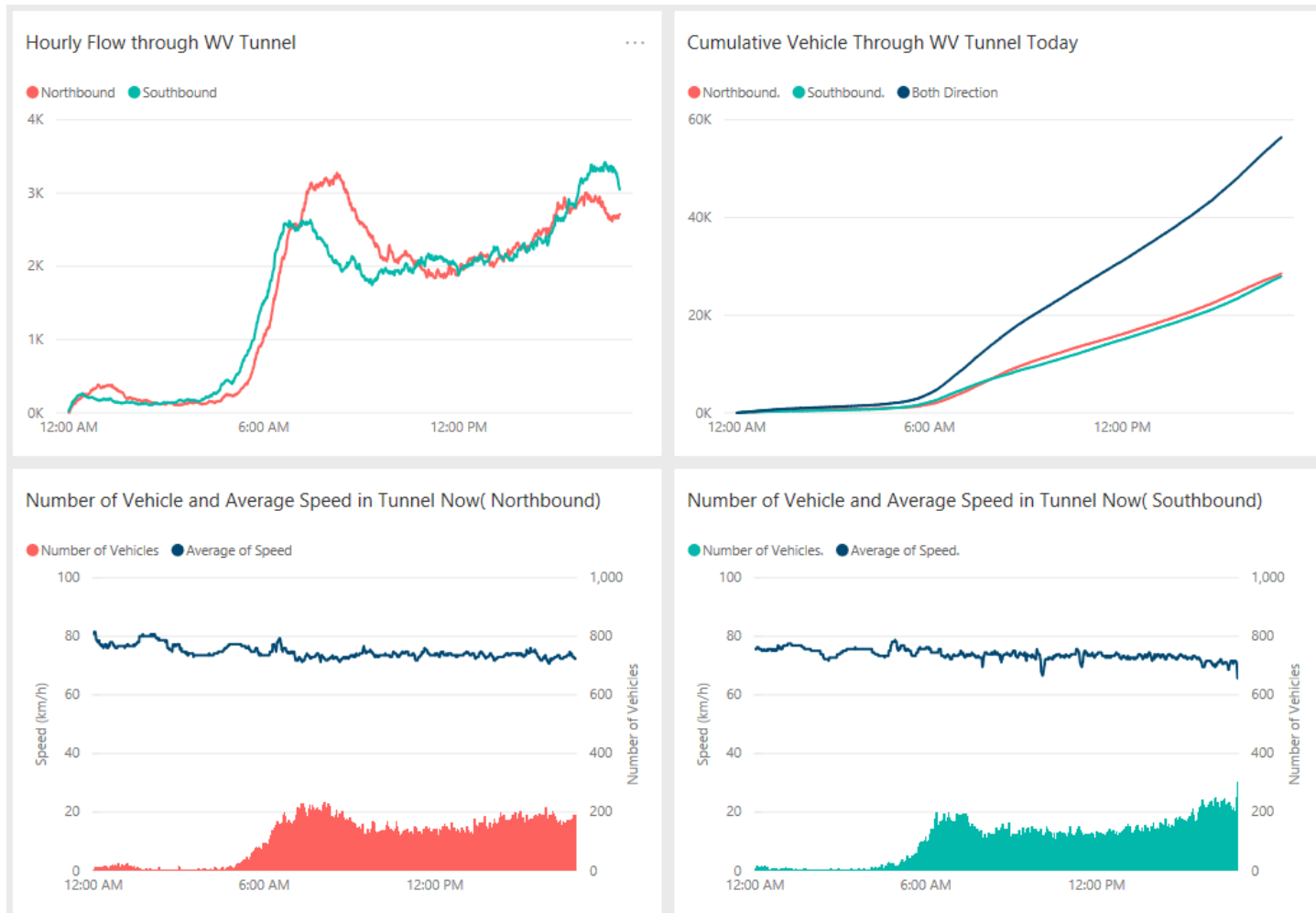


GoogleRoute Travel Time

● Current ● Baseline



Waterview Connection, AMA, Power BI



Waterview Tunnel cuts travel time on Auckland motorways, says Simon Bridges

Auckland's Waterview Tunnel has cut travel demand on State Highway 1 in the city by about 7 per cent, officials say.

There has been a corresponding increase on SH20 and SH16 and the redistribution "is resulting in a more efficient motorway system with around 8500 fewer hours each day of total travel time on the motorways alone", Transport Minister Simon Bridges said.

"Around 60,000 vehicles are using the Waterview Connection each day, with more than 2 million vehicles now having travelled through the twin tunnels between the suburbs of Owairaka and Waterview," Bridges said.

Ref: http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11898520

New Zealand Herald,
August 3rd 2017

AssetMetrics – Deterioration Prediction

Big-data based infrastructure management: toward Assetmetrics

K. Kobayashi
Kyoto University, Kyoto, Japan

K. Kaito
Osaka University, Osaka, Japan

Life-Cycle of Structural Systems – Furuta, Frangopol & Akiyama (Eds)
© 2015 Taylor & Francis Group, London, 978-1-138-00120-6

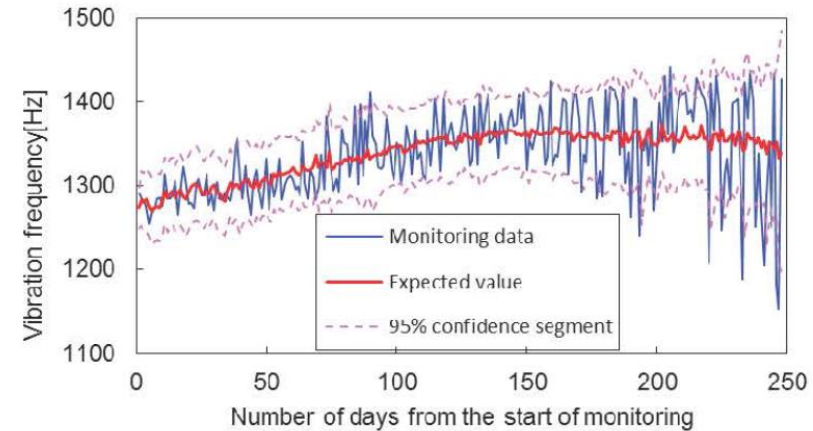
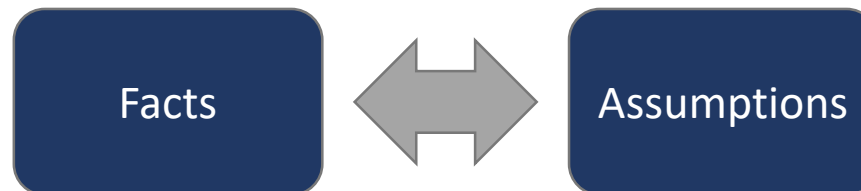


Figure 5: ARMAX-GARCH model and monitoring data

- High volume of data leads to greater reliability



Example: Old Mangere Bridge

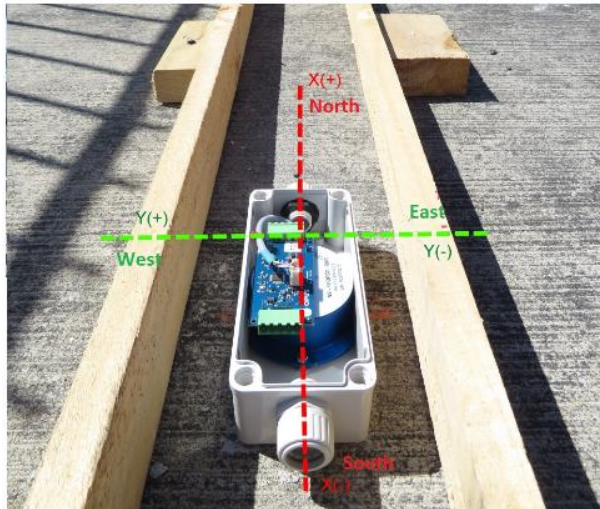


Auckland Motorways

Show Historical Data

☒ Historical Data

☒ Last Seven Days



ALL Selected

ALL Selected
X-axis Amber Max.

ALL Selected
X-axis Red Max.

ALL Selected
Y-axis Amber Max.

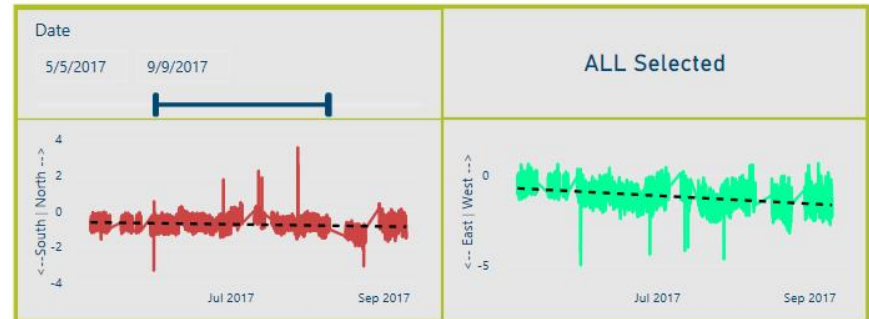
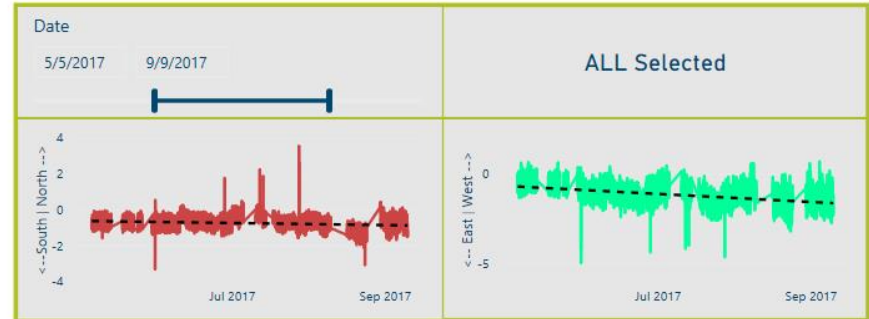
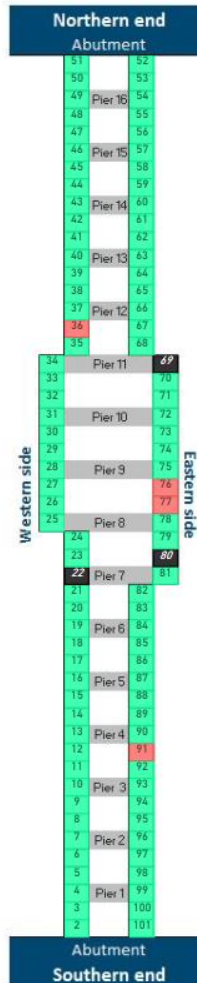
ALL Selected
Y-axis Red Max.

ALL Selected
X-axis Amber Min.

ALL Selected
X-axis Red Min.

ALL Selected
Y-axis Amber Min.

ALL Selected
Y-axis Red Min.



Other Notable Projects

- **Auckland Council**; NZ Infrastructure Data Standards
- **Choice App**; Smart Mobility app, real-time travel options
- **Modelling**; Road Asset Deterioration, Transport, Traffic
- **Bus Travel Time Reliability**; predictable journeys
- **Integrated Data Infrastructure (IDI)**

Transport Analytics

How we typically work now

- **Descriptive** - What happened?
- **Diagnostic** - Why did it happen?

Insight and Foresight - Huge Potential for NZ Transport

- **Predictive** - What will happen?
e.g. use of statistical models to enhance precision.
- **Prescriptive** - How can we make it happen?
e.g. strategic planning with strong Predictive analytics

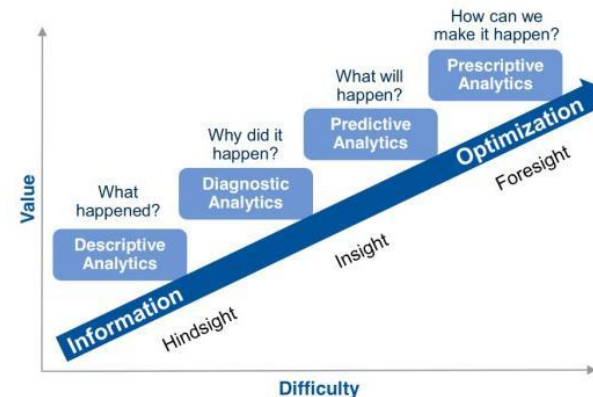
Conclusions

Big Data investment:

- New Zealand has only started to realise value.
- Be clear on your requirements.
- Set a starting position on what you are looking for.
- Align your initiative to standards, where possible.

Big Data can become your most valuable IT investment:

- Define your analytics journey



Questions?



To join, please email
knowledgehub@transport.govt.nz



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www.opus.co.nz



MEngNZ



Gold Status
Member



B.Tech (Hons)

Purpose

- **Connecting data people with data people**
- A community of people who work with transport data and information.
- We provide a forum for sharing knowledge and experience and work together to improve our access to transport data.

Capability

- Grow the capability of subject matter experts to put people and systems in place to share and make best use of transport data
- To help develop initiatives that actively align with and support NZ Transport investment objectives.

Membership



- The hub is open to anyone interested in transport-related data and information.
- To join, please email knowledgehub@transport.govt.nz
- Launch event in early 2018

<http://www.transport.govt.nz/research/transport-knowledge-hub/data-2/>