MOVING TO SOCIOTECHNICAL ASSET MANAGEMENT OF AN INTERCONNECTED NETWORK OF BRIDGES

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Mackinac Bridge, Michigan, USA
Overview

• Introduction
• Definitions
• Context and Case Study
• Benefits
• Summary
• Acknowledgements
• Questions
INTRODUCTION
Who is Opus?
Who is Opus?

- Asset Management: 41%
- Transportation: 9%
- Water: 12%
- Building Design and Construction: 29%
- Other Infrastructure: 9%
Who am I?

14 Jan 2015

19 Jan 2015 (5 days later)
DEFINITIONS
What is Socio Technical AM?

• Recognition that Asset Management is as much technical process as it is social process
• 6 year history (in AM)
• Part of ISO 55000 – International AM Standard
How do we apply that to bridges?

• Typical triggers for intervention:
  • Condition
  • Obsolescence
  • Capacity

Technical Approach

• Where do the users come into this discussion?
A sociotechnical approach...

• Explore stakeholder reactions to investment decisions
• Combine with technical requirements
• Result?
  • An investment program that looks after the asset and the people
Socio Technical Asset Management is a Balancing Act!

- Budget
- Stakeholder Satisfaction
- Risk
- Inventory
- Consequence of Failure
- Services

Relationship Between Budget, Inventory, Technical Measures and Risk

- Budget
- Inventory
- Consequence of Failure
- Risk

Stakeholder Satisfaction
CONTEXT – HOW DOES IT WORK?
Leveraging Agent Based Modelling as the enabler

- Helps us understand asset performance
- And gauge stakeholder reactions
- Historically used by
  - Behavioral economists
  - Socials scientists
What does an ABM include?

• Three components
  • Stakeholders
  • Relationships
  • Environment
Understanding the Stakeholder is key!

- Who are they?
- How do they interact with each other?
- How do they interact with the asset?
- This helps define the rules in the model
  - Satisfaction
  - Thresholds
We need more than just engineers and asset managers!

- Operational Researchers
- Behavioral Scientists
- Economists
To run the model...

- Programmers if developing own model
- COTS Software
  - Over 70 packages (Wikipedia 2016)
  - Varying degrees of GIS capability
APPLYING THE MODEL – NZ CASE STUDY

Sea to Sky Highway, Canada
Applying ABM to NZ Bridges

- Increase in truck mass by ~ 15%
- Limited routes initially
  - Due to bridges across network
- Routes expected to grow, but performance variable
- Strengthening need > $$
Applying ABM to NZ Bridges

• Technically knew what was required
  • List of bridges requiring strengthening
  • Technically prioritized

• But what was socially required?
  • Would that change the technical prioritization?
Applying ABM to NZ Bridges

• Solution - ABM:
  • Engage with the trucking industry to understand their needs and constraints

• Outcome:
  • Prioritized Bridge Performance Improvement Program that catered for the asset as well as the users
Applying ABM to NZ Bridges

Things to note:
1. The tipping point in satisfaction, which results in the system entering a new state of equilibrium
2. The small number of bridges that cause the tipping point
3. The non-linear relationship between the numbers of weak bridges and satisfaction
4. Although mean bridge reliability is good and bridges are still safe (i.e. above 3) driver satisfaction levels are still dropping.
BENEFITS

Northern Busway, Auckland, New Zealand
Stakeholder Engagement

Customer Expectation

Level of Service

Refined Investment

Customer Satisfaction
Challenges our thinking*....

The outdated linear view of the world

The modern feedback view of the world

*Sterman 2001
Key Points

• Socio technical AM brings together the needs of the people and the needs of the asset

• Agent Based Modelling is enabler
Key Points

• Very powerful tool in asset devolution situations
• Gets our communities involved in our decisions
• Allows us to be better asset managers
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One last thing...

KPI Achieved! 174 days ahead of schedule....
THANK YOU FOR LISTENING

QUESTIONS?

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