Intermodal freight transport in the wake of an earthquake: key enablers and existing barriers in New Zealand

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Freight systems

- Sophisticated and efficient freight systems

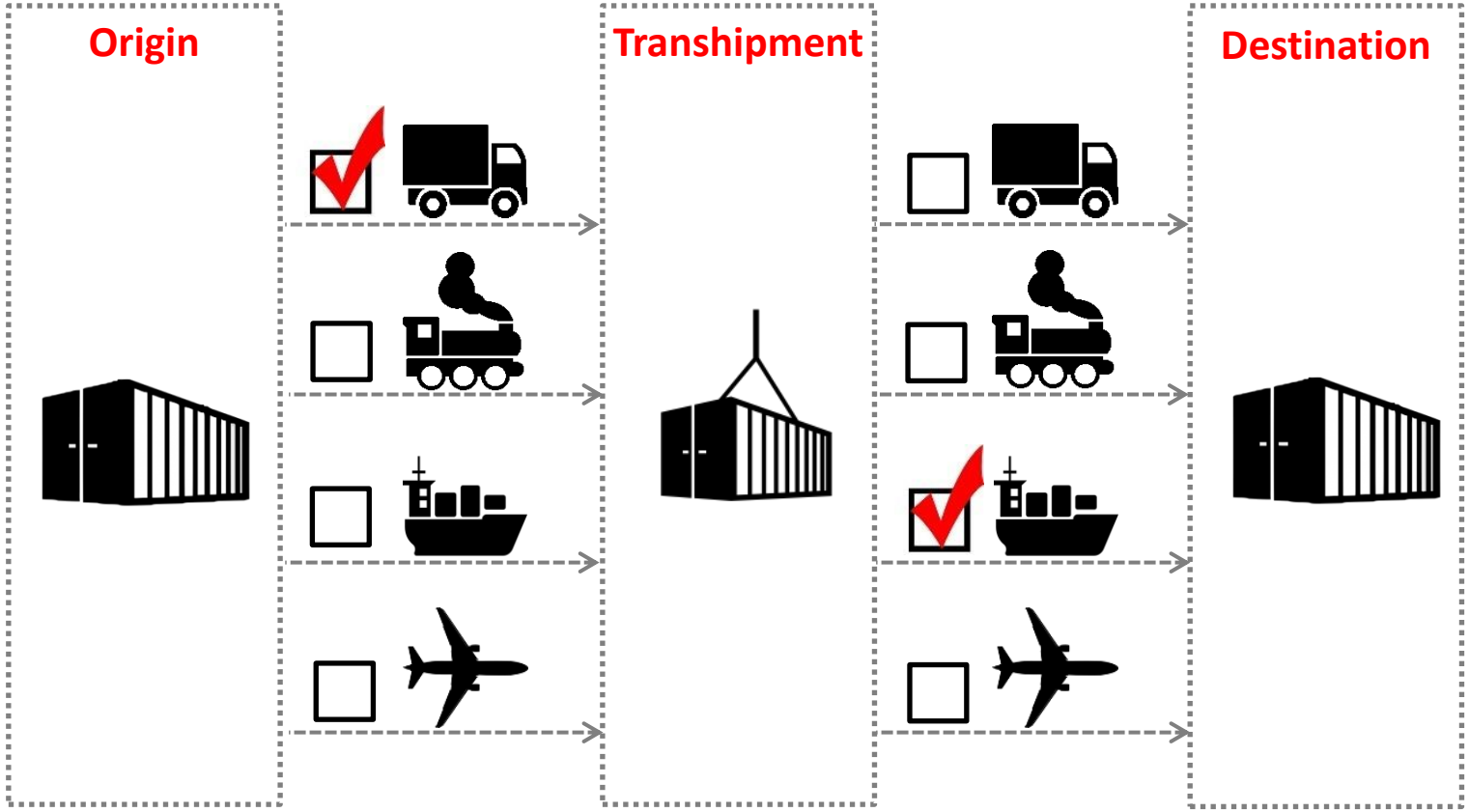
Research focus

- Earthquakes disrupt pre-existing transport networks and freight operations
  - To ensure supply chain continuity, freight operations are swiftly adjusted across modes
  - However, the factors influencing rapid modal shifts in the wake of an earthquake were not well understood

→ The research aimed to identify the **key enablers** and **existing barriers** to the rapid reconfiguration of freight movements when an earthquake strikes

Theoretical background

- Synchromodal transport
  - The real-time planning of freight movements and rapid shifting between modes to create efficient flows of goods



(Farahani et al., 2018)

Theoretical background

- Synchromodal transport requires:
  - **Physical interconnectivity** – the physical elements of the transport system (infrastructure, vehicles, standard load units)
  - **Digital interconnectivity** – the use of data and technology facilitating freight routing/re-routing
  - **Business interconnectivity** – the elements that increase interoperability and govern the relationships between organisations

Qualitative methodology

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Data collection: **19 interviews with 27 key informants**

Data analysis: **thematic analysis of the interview transcripts**

Outcome: **identification of 14 enablers and 17 barriers**
to the rapid reconfiguration of freight operations
across modes in the wake of the Kaikōura earthquake

Findings

- Physical interconnectivity

Physical enablers	Physical barriers
Availability of coastal shipping capacity (domestic and international ships)	Inadequate secondary road network
Availability of port capacity (including inland ports)	Vulnerable infrastructure at the smaller, domestic seaports
Availability of airfreight capacity (especially for perishables)	Curtain-siders traditionally used for road transport in NZ instead of container trailers
The rapid upgrade and use of the Spring Creek intermodal terminal	Insufficient shipping container capacity

Findings

- Digital interconnectivity

Digital enablers	Digital barriers
Electronic booking systems in place	Lack of standardised data format
	Lack of interoperable information systems leading to the use of manual processes and verbal communication
	Lack of advance demand information preventing efficient resource planning

Findings

- Business interconnectivity

Business enablers	Business barriers
Well-established industry contacts (e.g. with transport suppliers, government officials, etc.)	Modal operators not fully understanding the specific transport requirements of other modes
Transport operators rapidly making their own decisions (without any intervention from central government departments)	Modes subject to different operational constraints (load weight, volume, pallet height, etc.)
	Lack of trust and reticence to engage with competitors in a whole market solution

Findings

- Overall, this study highlighted:
  - The importance of building redundancies at all levels
    - Infrastructure (e.g. roads, seaports)
    - Modes
    - Equipment (shipping containers)
    - Safety stock (≠ reliance on just-in-time deliveries)
  - The need for a more integrated freight system in NZ
    - Use of shipping containers for domestic movements of goods
    - Standardised data format and for interoperable information systems

What's next?

- Further research avenues
  - Using data standards, digital technologies and data analytics
  - Achieving value for money: evaluating the costs, benefits and net impacts of building redundancies in the transport/supply chain system
  - Pre-positioning (storage of equipment and supplies close to areas likely to be affected by natural hazards, e.g. Wellington)
  - Identifying and mitigating transport capacity constraints in the event of a prolonged Cook Strait ferry outage
  - Modelling freight movements through transport nodes and links (both inter-city and urban supply chain networks)

Discussion

Questions? Comments? Ideas?

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