Understanding the Value of Travel Time Reliability for Freight Transportation

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Outline

• Background
• Purpose
• Objectives
• Challenges
• Tasks :
  – Task 1 : Literature Review
  – Task 2 : Stated Preference Survey Design
  – Others ........
Background

- Growing demand for freight transportation
- Better understanding of freight behavior
- Increasing role of reliability in freight transportation
Purpose

• Research in understanding the behavior paradigms in the freight industry has lagged behind.

• Only a handful of studies from other countries investigated Value of Reliability (VOR) for freight users.

• This study aims to fill the knowledge gap in understanding how the freight community value travel time reliability in their transportation decisions.
Purpose

• Support **strategic, proactive and responsive** investment decisions that reflect the needs of freight stakeholders, which requires
  – better understanding of how the users (shippers and carriers) respond to system changes in productivity, reliability and capacity, and
  – advanced methods and tools in evaluating the effectiveness of alternative freight management and operational strategies.
Objectives

• Synthesize existing studies on VOR and identify knowledge and data gap;

• Conduct stated preference survey among freight system users to understand their transportation choice decision-making;

• Develop econometric models to estimate VOR by stratification, such as, commodity type, shipping distance, and shipment type, etc.

• Recommend a framework in incorporating VOR in freight analysis and project evaluation.
Challenges

• **Insufficient knowledge** in freight transportation and supply chain management, and lack of mechanism to incorporate the knowledge into the freight planning process;

• **Lack of data** in supporting research and modeling efforts as freight movement data tend to be proprietary in nature, aggregate in geographic scale, and difficult to collect from private sectors; and

• **Lack of guidance** in freight sector survey design in constructing realistic alternative scenarios and questionnaire for the respondents.
Project Tasks

• Task 1: Literature Review
• Task 2: Stated Preference Survey Design
• Task 3: Technical Advisory Committee (TAC) Establishment
• Task 4: Survey Implementation
• Task 5: Data Processing and Model Development
• Task 6: Framework Recommendation
• Task 7: Final Report
Project Tasks

• Task 1: Literature Review
  – A wealth of knowledge in VOR for passenger travel
  – Not limited to only stated preference reliability papers
  – Few studies in the freight industry from other countries
  – SHRP2 reliability projects
  – Nos. of Paper: 83
Project Tasks 1: Literature Review

• Major findings
  – Reliability Measures:
    • Standard variation of Travel time
    • Probability of success or failure against a pre-established threshold value
  – Methods to Estimate the VOR for Freight:
    • Stated Preference (Shippers vs Carriers)
    • Inventory based (tied to inventory management decisions)
Project Tasks 1: Literature Review

• Major findings
  – Market Segmentation:
    • Previous studies focused mostly on mode choice or route choice
    • Common categories:
      – Commodity Type (time sensitivity, amount, values)
      – Shipment characteristics (such as type, weight, distance)
      – Firm’s Characteristics (size, transport ownership, inventory management)
      – Miscellaneous (time of day, congestion vs non-congestion, regional differences)
Project Tasks 1: Literature Review

• Major findings
  – Survey Design:
    • Previous studies mostly used Orthogonal experiment
    • Very few studies used Others experiment, such as Optimal-efficiency, or Adaptive Stated Preference
    • Trade-off among statistical efficiency, complexity, monetary budget and quality of responses
  – Model Specification & Development:
    • Most commonly used attributes: Travel cost, Travel time, Reliability, Loss and/or damage, and Service Frequency & Flexibility
    • Mixed Logit, MNL (with bootstrapping to account for the IIA violation)
# Project Tasks 2: SP Survey Design

- **Market Segmentation**
- **Sample Design**
- **Recruitment**
- **Instrument Design**
- **SP Choice**
- **Experimental Design**

## Flowchart

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Survey Method
- Internet
- Computer assisted Telephone Interview (CATI)

Survey Sample Design
- Market segmentation
- Sample size

Questionnaire Design
- Identification of alternatives, attributes & attributes level
- Experimental design
- Generate choice sets

Recruitment
- Recruitment of respondents
- Collection of background information for screening purpose

Sample enough? No
- Yes
- Data processing & Monitoring

Yes
- Revision required?

No
- Retrieval

Yes
- Sample enough?

No
- Pilot Survey

Survey Implementation

Yes
- Revision required?

No
- Main Survey

Model Estimation
- Preliminary VOR Estimates

Model Verification
- Final VOR Estimates

Main Survey
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**Survey Method**

- Internet
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**Pilot Survey**

- Survey Implementation
- Retrieval

**Revision required?**

- Yes
- No

- Main Survey

**Model Estimation**

- Preliminary VOR Estimates

**Model Verification**

- Final VOR Estimates
Project Tasks 2 : SP Survey Design

• Market Segmentation
  • Commodity Type for shippers: Perishable Commodity, Time Sensitivity
  • Shipping Distance for carriers: <50, 50-300, and 300+ miles.
  • Shipment Type: Containerized or Non-Containerized
  • Mode: Truck (Light, Medium, and Heavy), Rail, Waterways and Air

• Sample Design & Data Collection
  • Stratification-based random sampling strategy
  • Database from Local Chamber & TranSearch

• Recruitment Instrument Design
  • Information describing the firm
  • Characteristics of a typical shipment
Project Tasks 2 : SP Survey Design

• SP Choice Experimental Design

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Questions & Answers

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