

# 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

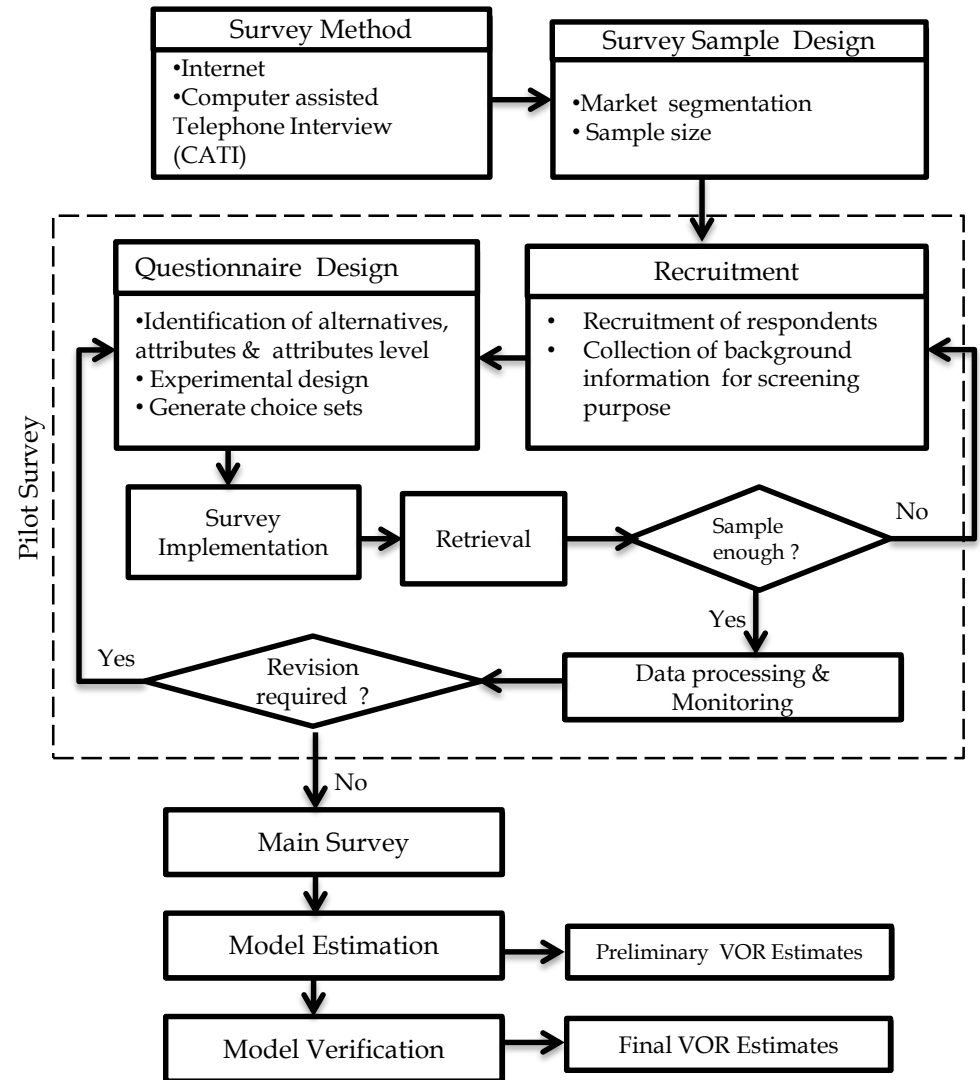
- Major findings
  - Market Segmentation :
    - Previous studies focused mostly on mode choice or route choice
    - Common categories :
      - Commodity Type (time sensitivity, amount, values)
      - Shipment characteristics (such as type, weight, distance)
      - Firm's Characteristics (size, transport 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



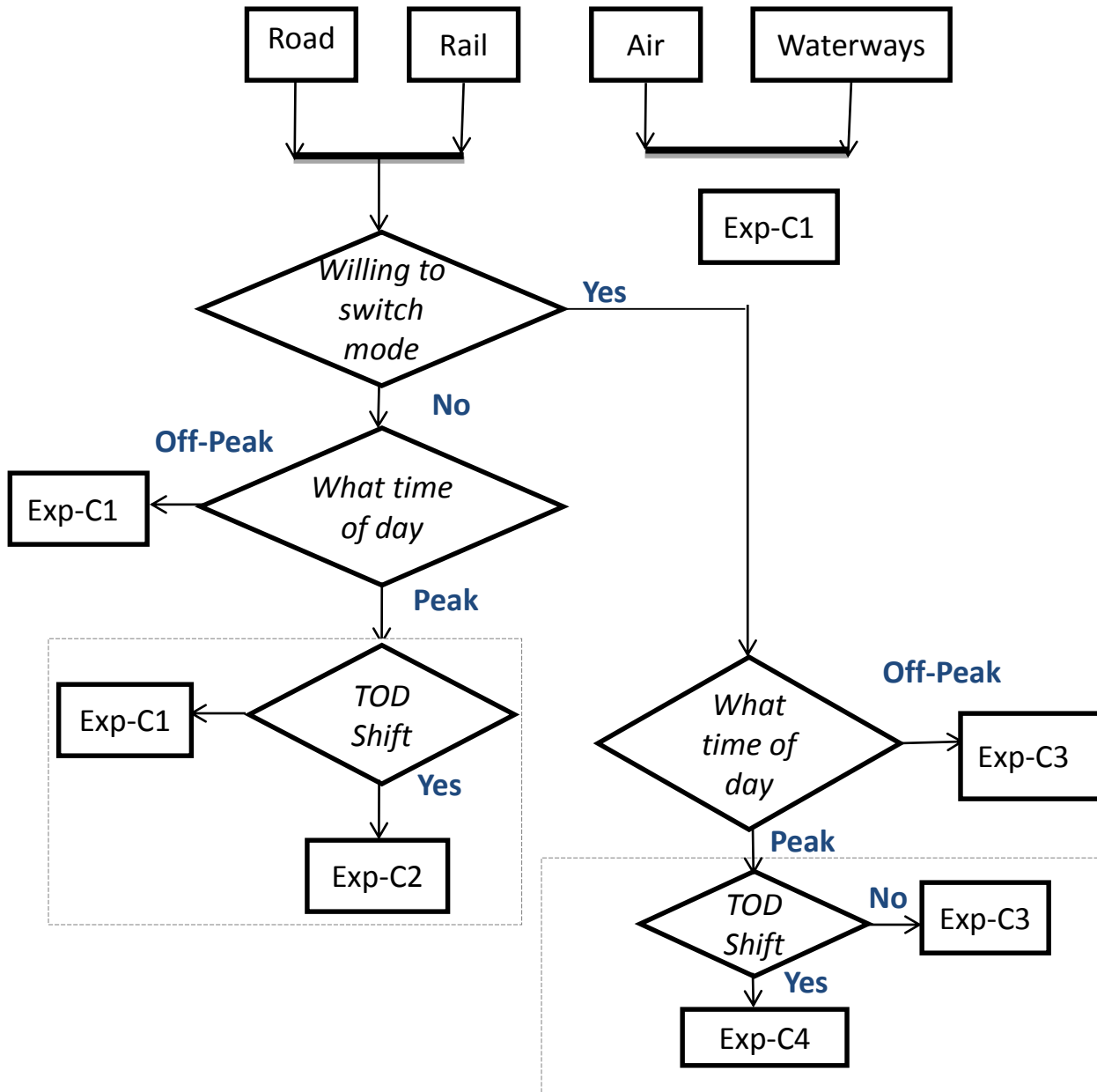
# Project Tasks 2 : SP Survey Design

- 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

Experiment Type	Alternatives Type	Nos. of Attributes	Attributes (Level)	Experimental Design	Road	Rail	Air	Waterways
C1	Within	3	Travel time (5), Cost (5), Reliability (5)	Orthogonal	√		√	√
C2	Within	4	Travel time (5), Cost (5), Reliability (5), Departure time (2)	Orthogonal	√			
C3	Between Modes (Road & Rail)	5	Travel time (5), Cost (5), Reliability (5), Service Flexibility (2), Probability of Property Damage (2)	Manual (Bradley)	√	√		
C4	Between Modes (Road & Rail)	6	Travel time (5), Cost (5), Reliability (5), Service Flexibility (2), Probability of Property Damage (2), Departure time (2)	Orthogonal	√	√		





**THANKS!**

## Questions & Answers

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