Measuring Impacts on Demands for *Transportation*

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| Milestones/Deliverables	Status	Anticipated completion time
1. A summary of alternative scenarios and methods for specifying them through SA and SP surveys.	Completed-In progress	↓
2. A descriptive analysis of SA/SP survey data	Completed-In progress	↓
3. A review of the literature and an annotated bibliography about travel demand modelling in the context of transformative technologies. (**Deliverable**)*	Completed-In progress	August, 2020
4. A report summarizing the key features of the modelling framework, including mathematical formulations, data specifications and estimation procedures. (**Deliverabl**e)*	In progress	December, 2020
5. A report on the empirical models of the modelling system. (**Deliverable**)	In progress	August, 2021
6. A report on scenario analysis, highlighting potential demands and impacts. (**Deliverable**)*	Pending	December, 2022

Overview

- Modelling Travel Demand and Land use Transportation Interaction

- Issues with modelling systems in using for predicting uncertain future

- Uncertain future and measurement

- Recent ongoing project works

Modelling Systems

- My group has been developing modelling system for travel demand and land use-transportation interaction modelling
  - Activity-based model for travel demand (CUSTOM)
  - Computational equilibrium model for land use-transportation interactions (TRANUS)
- It is important to have such modelling systems that are based on sound theoretical foundations
- However, empirical version of the models need data:
  - Data are observations of reality
  - Data are measurements of demand and demand generating factors/variables

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Modelling Systems

- Rich in theory
- Poor in Data:
  - We need real observations to estimate model parameters

  - This means models can reproduce what happened in the past

  - How about the uncertain future?
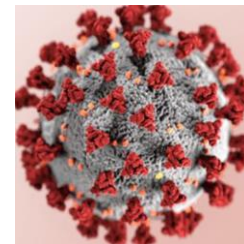
Potential Impacts of Transformative Transportation Technologies/Policy

- **Increase** VKT?
- **Increased** in number of trips?
- **Reduced** Transit Modal Share? (**Reduced** Transit Usage?)
- **Increased** single-occupancy travel?
- **Reduced** Privacy?
- **Better** Land Use?
- **Increased** Social Equity?
- **Reduced** Car Ownership?
- **Reduced** Stress?
- **Increased** Safety?
- **Reduced** Emissions?
- And many more…!

COVID-19 induced lockdown/Social distancing and the fear of getting infected introduced a real kink to these concerns

Transformative and Automated Transportation: Impact Measurement Perspective
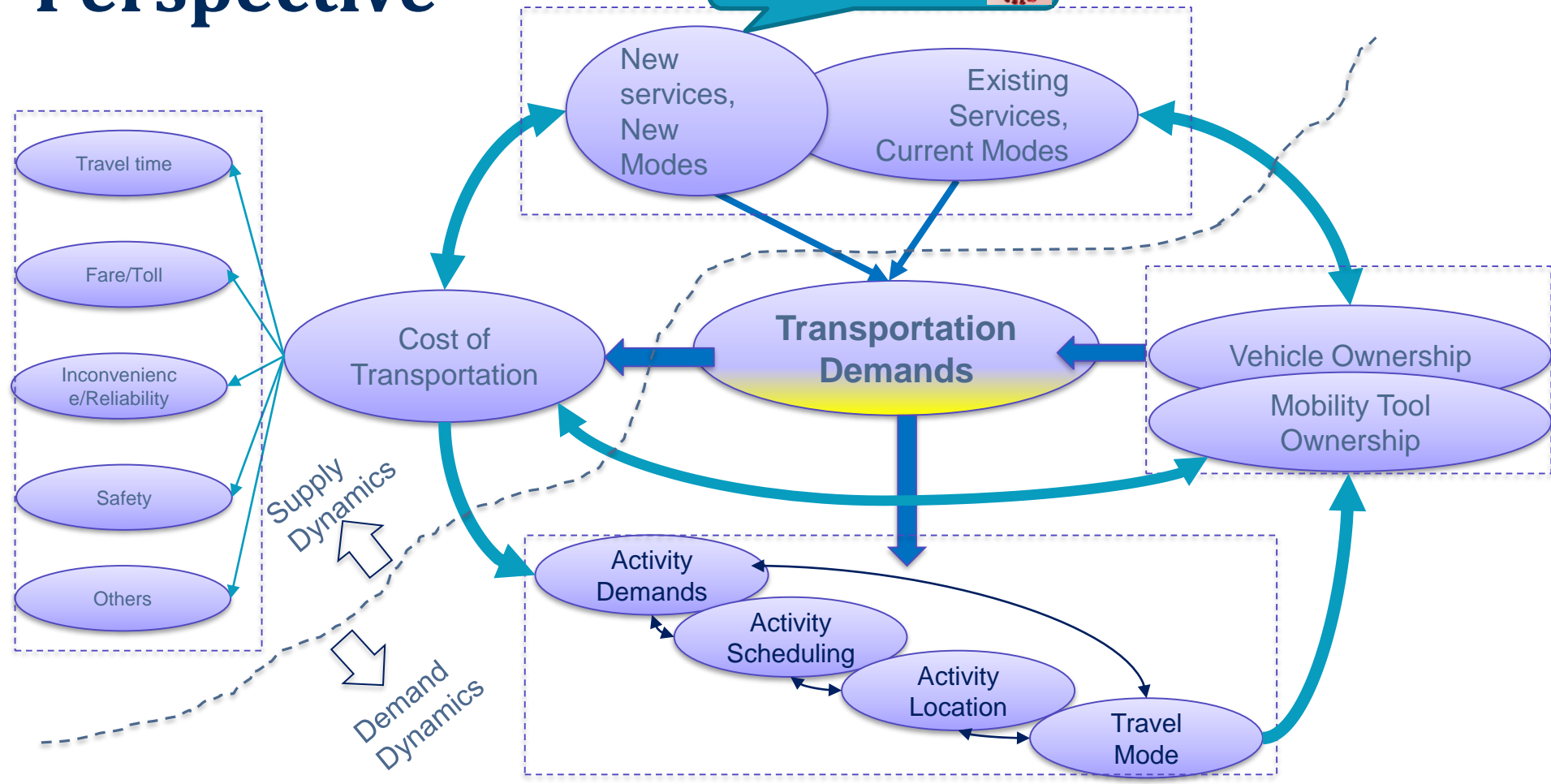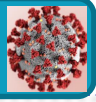
Uncertain Future

- Uncertainty:
  - Conventional ownership versus ridehail/rideshare service?

  - How much these services will cost?

  - Will AVs have a noticeable positive impact on traffic flow and travel time?

  - Will people be willing to share AVs or are SOV trips going to continue to be the norm?

Problems:

- Massive set of potential impacts and large amount of uncertainty

- We have no way of predicting what will happen without prior observation

- No guarantee that existing modelling systems will give accurate prediction of the future:
  - **If models use only revealed information**

Research Challenge

- New Modelling System or New Data ?
- Answer:
  - Data: measurement of responses (people and firms) in contexts of new options, new technologies.

  - Policy sensitive modelling system: components of activity-based travel demand modelling system

  - Policy sensitive modelling system: components of land use transportation interaction modelling system

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Projects on Measuring Demand Impacts

1. 2018 Experiment on Travel Mode Choice in Context of Shared and non-Shared AV (SAVER)-Adam Weiss & Faizus Salehin

2. 2019 Experiment on Willingness-to-pay for Automated Vehicle technologies (SWAVE)- Kaili Wang& Faizus Salehin

3. 2019 Experiment on AV impacts on Vulnerable road users: People with vision impairment in an era of AV (SUVII)-Sina Azizisoldouz

4. 2020 Further Experiment on Willingness-to-pay for Automation (considering the COVID-19 Impacts)- Kaili Wang& Faizus Salehin

1. SAVER: Survey on Autonomous VEhicles and Ride-hailing

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1. On-Going Research

- ✓ Specification of generalized mode choice model that can fit into different modelling system (activity-based modelling framework)

- ✓ Linking travel mode choice (that include AV modes) and Trip destination location choices for commuting and non-commuting trips

- ✓ Joint mode-destination choice model would be necessary for network modelling

2. SWAVE Survey: Survey on Willingness-to-Pay for Automated/Autonomous of Vehicle technology

2. Willing-to-Pay for Automation

$$WTP = \frac{\beta_{level\ of\ automation}}{\beta_{additional\ cost, vehicle\ price}} \times \ln(vehicle\ price)$$
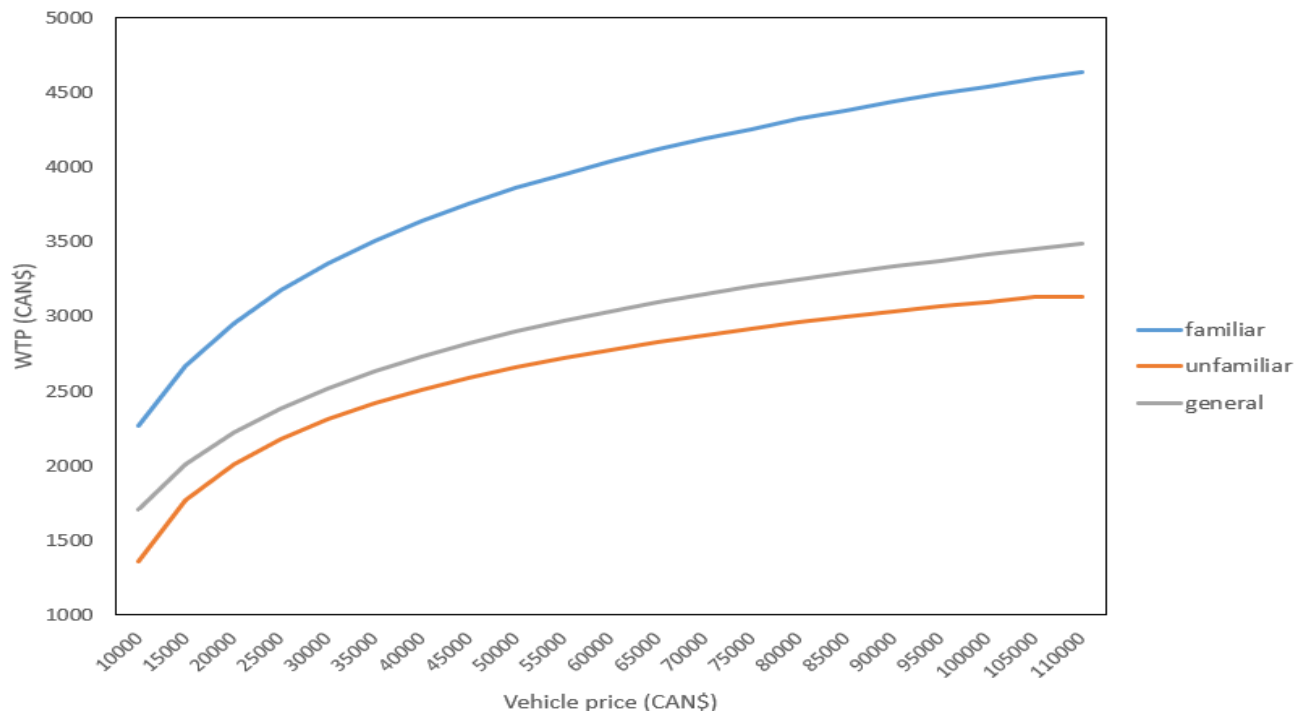
Estimated Willingness-to-pay for level 4 automation vs. Vehicle Price

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3. SUVII: **SU**rvey on **V**isually **I**mpaired **I**ndividuals

3. Policy Recommendations

- The importance of hearing sounds from CAVs on roads and cyclists on sidewalks

- Getting feedback and alerts from CAVs

- Acoustic Vehicle Alert System (AVAS) to both EVs and CAVs

- Role of Orientation & Mobility (O&M) training services

- Providing subsidies for developers to specially design an application that has better accessibility for people with visual impairment

4. Willing-to-Pay for Automation: Further Probing: SUVII 2.0

➢ Further probing necessary to capture safety perception influencing the willingness-to-pay

➢ Being redesigned to accommodate COVID-19 Impacts

➢ Also, it is necessary to establish links among willingness-to-pay for automation, use of AV for daily trips (travel mode choice) and long-term household choices of dwelling type and residential location

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Q&A

Thank you for listening