TCRP H-37: *Characteristics of Premium Transit Services that Affect Choice of Mode*

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Prepared for:
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Overview

1. Literature Review
2. Surveys
3. Quantifying Premium Transit Attributes
4. Transit Familiarity and Awareness
5. Conclusions
6. Next Phase

Project Overview

- **Purpose**
  - To describe the most important factors that differentiate premium transit services from standard transit services
  - To provide methods to measure the impact of these distinguishing features
  - To propose ways to incorporate these measurements into regional planning activities
- **Approach**
  - To quantify non-traditional transit attributes that affect mode choice
  - To evaluate transit familiarity and awareness
- **Phase 1 (complete)**
  - Data collection for one city – Salt Lake City
  - Research and analysis of non-traditional transit attributes in mode choice models and awareness of transit services
  - Recommendations to bring these analyses into practice
- **Phase 2 (underway)**
  - Data collection for two cities – Chicago and Charlotte
  - Additional analyses of attributes and awareness, including choice set and mode choice models
  - Demonstration of the models in practice in one city (TBD)

Literature Review Focus

- **Transit awareness and familiarity**
  - The lack of transit awareness and familiarity with transit seems to be significant, though there is not yet abundant research on this topic.
- **Identification of transit service attributes**
  - The results of eight studies yielded the four most important attributes: reliability, station/stop comfort, on-board amenities, and real-time information.
- **Applied models**
  - A different set of eight case studies are described in the literature review on applying nontraditional attributes. Given the uncertainty about modal preference and the difficulties of quantifying the underlying factors, practitioners trying to match observed transit usage typically use simplified approaches that try to represent a general preference toward certain modes without explicitly representing the reasons that these preferences might exist.

Literature Review: Non-traditional Attributes

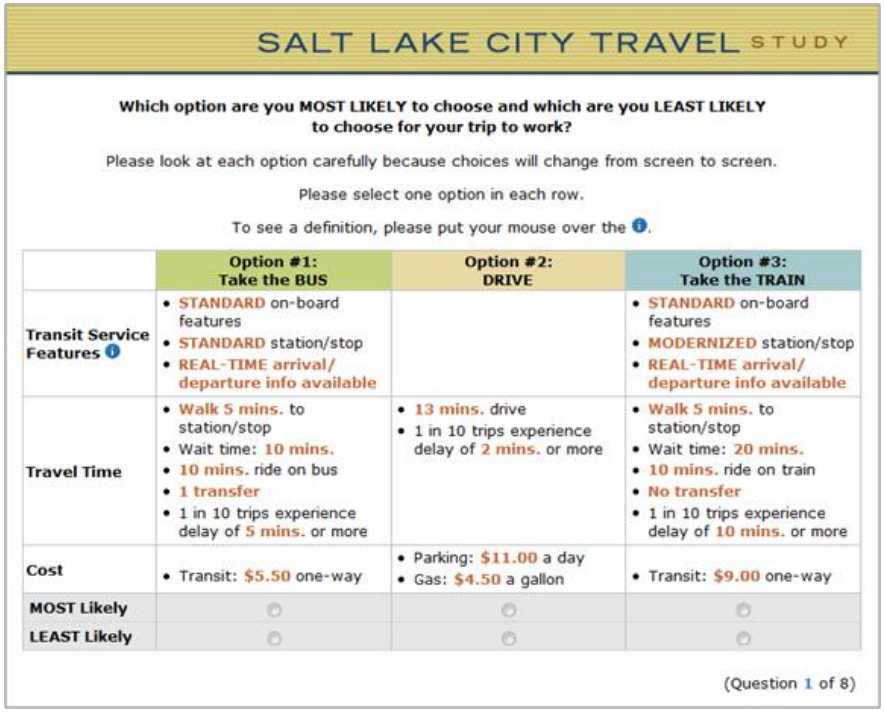
- **Reliability:** right of way, signal priority
- **Convenience:** type of transfers, span of service
- **Comfort:** at station or stop, cleanliness, shelter and seating; on-board, layout and seating,
- **Crowding:** seat capacity, seat availability, standing, crush loads
- **Accessibility:** walkability, ease of boarding, parking availability
- **Information services:** route information, announcements, real time arrival information
- **Fare payment:** POP, payment ease, speed of boarding
- **Safety:** Cameras, day/night security, lighting, visibility

All of these attributes were included in mode choice model estimation and quantified except fare payment

Salt Lake Survey

- **Part 1:** Background
- **Part 2:** Transit Awareness and Consideration
- **Part 3:** Trip (Revealed Preference)
- **Part 4:** Trip (Stated Preference)
- **Part 5:** Transit User Preferences
- **Total Respondents:** 2,017

Sample Screens from Salt Lake City Survey on Maximum Difference Scaling



SALT LAKE CITY TRAVEL STUDY

Which option are you MOST LIKELY to choose and which are you LEAST LIKELY to choose for your trip to work?

Please look at each option carefully because choices will change from screen to screen.

Please select one option in each row.

To see a definition, please put your mouse over the ⓘ.

	Option #1: Take the BUS	Option #2: DRIVE	Option #3: Take the TRAIN
Transit Service Features ⓘ	• STANDARD on-board features • STANDARD station/stop • REAL-TIME arrival/ departure info available		• STANDARD on-board features • MODERNIZED station/stop • REAL-TIME arrival/ departure info available
Travel Time	• Walk 5 mins. to station/stop • Wait time: 10 mins. • 10 mins. ride on bus • 1 transfer • 1 in 10 trips experience delay of 5 mins. or more	• 13 mins. drive • 1 in 10 trips experience delay of 2 mins. or more	• Walk 5 mins. to station/stop • Wait time: 20 mins. • 10 mins. ride on train • No transfer • 1 in 10 trips experience delay of 10 mins. or more
Cost	• Transit: $5.50 one-way	• Parking: $11.00 a day • Gas: $4.50 a gallon	• Transit: $9.00 one-way
MOST Likely	○	○	○
LEAST Likely	○	○	○

(Question 1 of 8)

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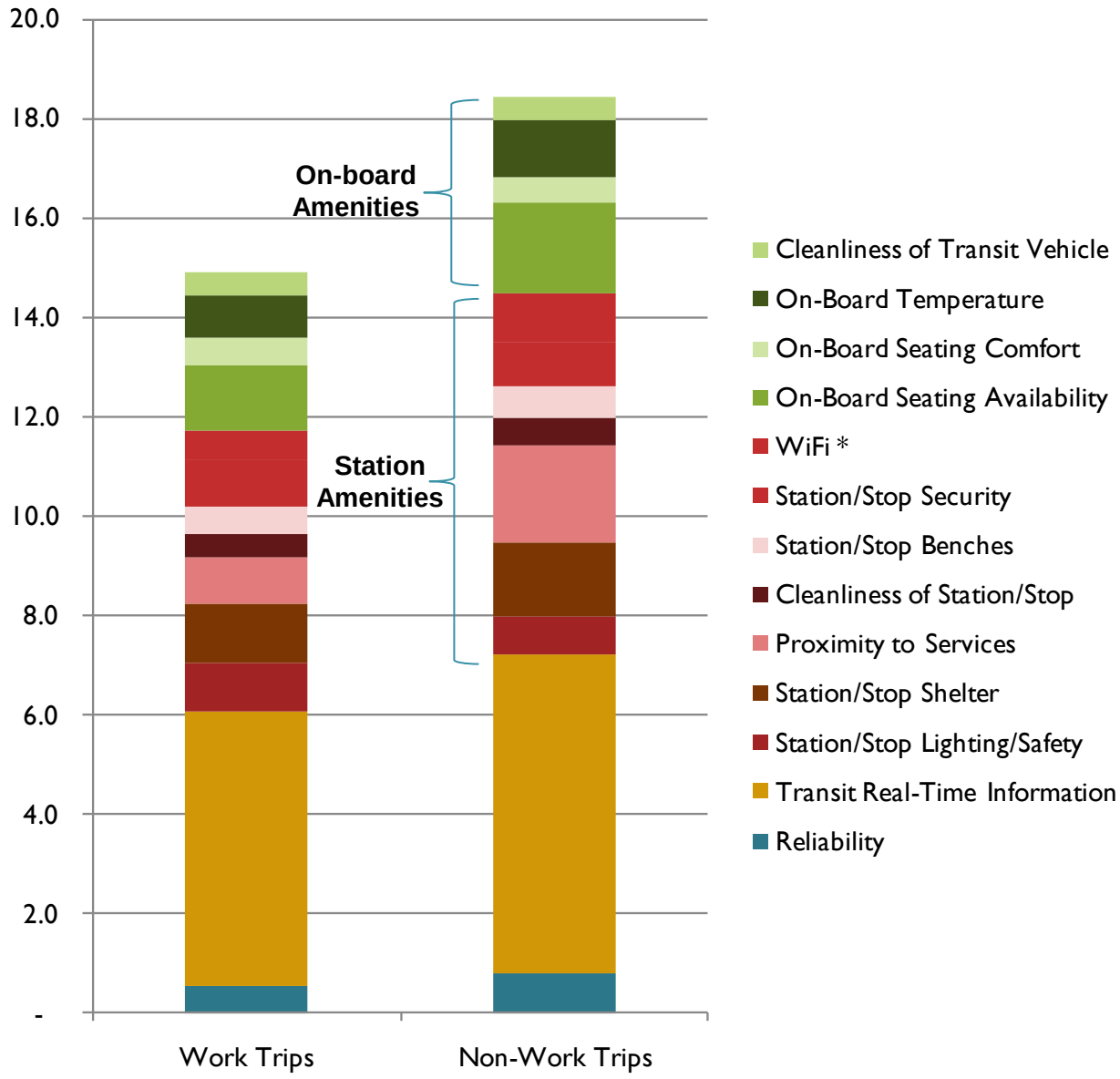
Quantifying Premium Transit Attributes

- Nested logit choice models for work and non-work purposes
- Generally reasonable coefficients for traditional attributes
  - Signs & magnitudes & relative ratios
  - No coefficients were asserted
- Coefficients for non-traditional attributes seem plausible
  - Effects were logical and statistically significant
  - Interaction terms help phase in effects over length of trip

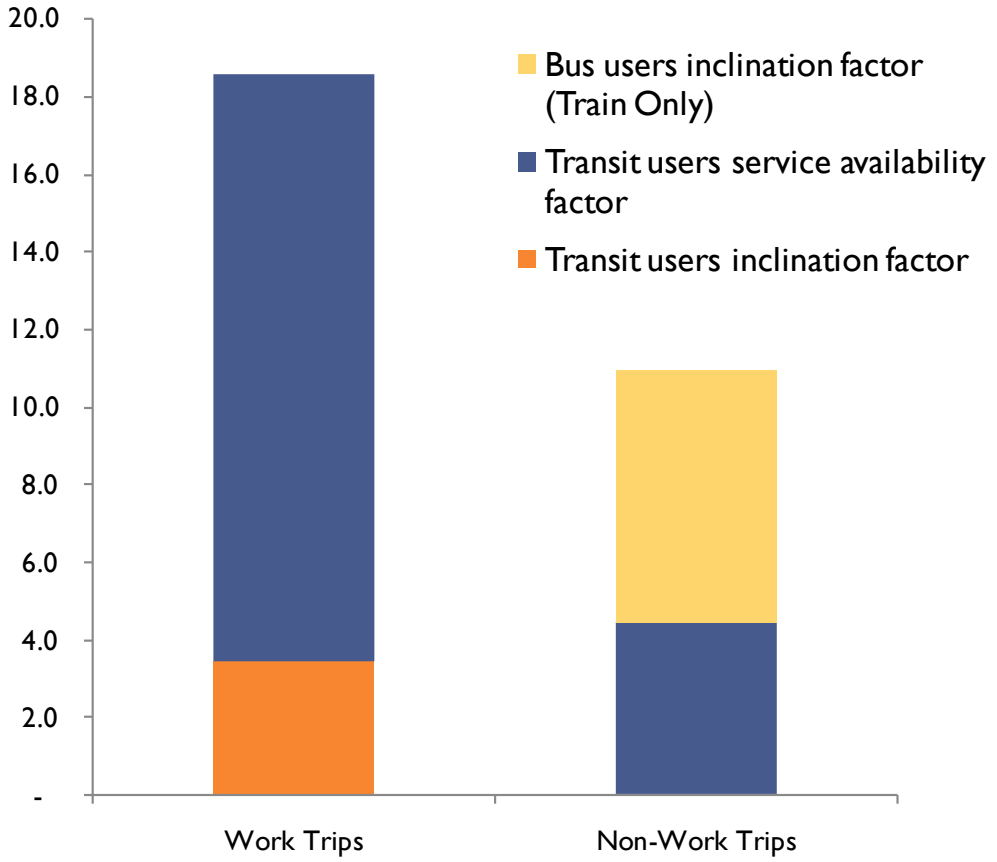
Attribute	Mode Uti	Coefficier	Std. Err	t-stat
IVTT_A (min)	Auto	-0.033	0.005	-6.329
IVTT_Transit (min)	Bus,train	-0.039	0.006	-6.897
Access time (min)	Bus,train	-0.054	0.009	-6.237
Wait time (min)	Bus,train	-0.053	0.004	-12.212
Trip Gas Cost ($)	Auto	-0.175	0.026	-6.679
Fare ($ one-way)	Bus,train	-0.405	0.02	-20.488
Parking Cost ($/day)	Auto	-0.235	0.007	-32.836
Reliability	All modes	-0.018	0.006	-2.969
Transfers (0 = no, 1 = yes)	Bus,train	-0.351	0.043	-8.17
Transit Info (0 = no real-time, 1 = real-time)	Bus,train	0.185	0.055	3.363
Stop design (0 = standard, 1 = modern)	Bus,train	0.167	0.043	3.846
On-board amenities (0 = standard, 1 = modern)	Bus,train	0.125	0.052	2.414
IVTT (min) with modern on-board amenities	Train	0.005	0.002	2.156
Wait time (min) with real-time information	Train	0.014	0.006	2.476
Option to work from home (0 = no, 1 = yes)	Train	0.905	0.23	3.932
Male (0 = no, 1 = yes)	Auto	-0.121	0.067	-1.8
HH income less than 125K (0 = no, 1 = yes)	Auto	-0.236	0.099	-2.381
HH income 125K or more (0 = no, 1 = yes)	Train	0.192	0.067	2.859
Origin TAZ is rural (0 = no, 1 = yes)	Auto	-0.965	0.495	-1.947
Origin TAZ is rural (0 = no, 1 = yes)	Train	0.855	0.385	2.224
Transit users inclination factor	Auto	-0.115	0.04	-2.855
Transit users service availability factor	Auto	-0.505	0.048	-10.452
Auto constant		0.71	0.158	4.484
Train constant		0.002	0.061	0.031
Bus constant		0	fixed	

Key Findings for Attributes



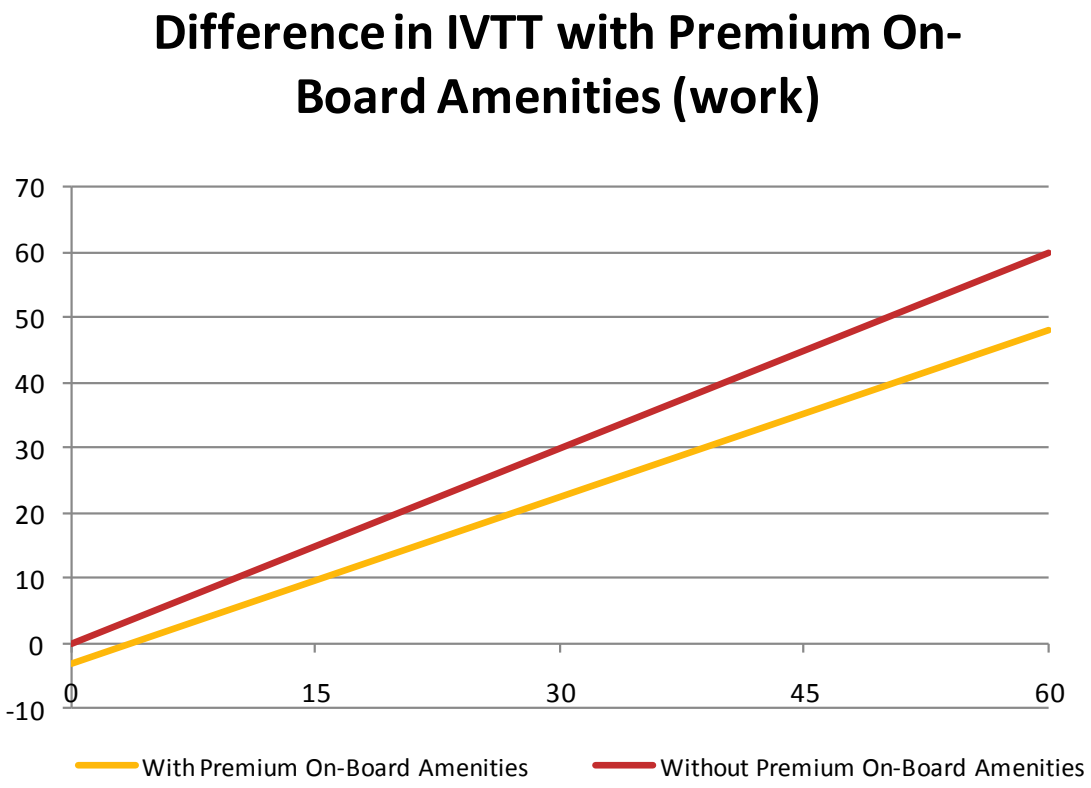
Key Findings for Attitudes

- **The convenience/inclination factor**
  - currently make an effort to take transit,
  - think the transit system is easy to purchase a fare, and
  - know when the next bus or train will arrive.
- **The service availability factor**
  - could use transit more frequently
  - are able to take transit from home to downtown Salt Lake City
  - are able to take transit to useful destinations



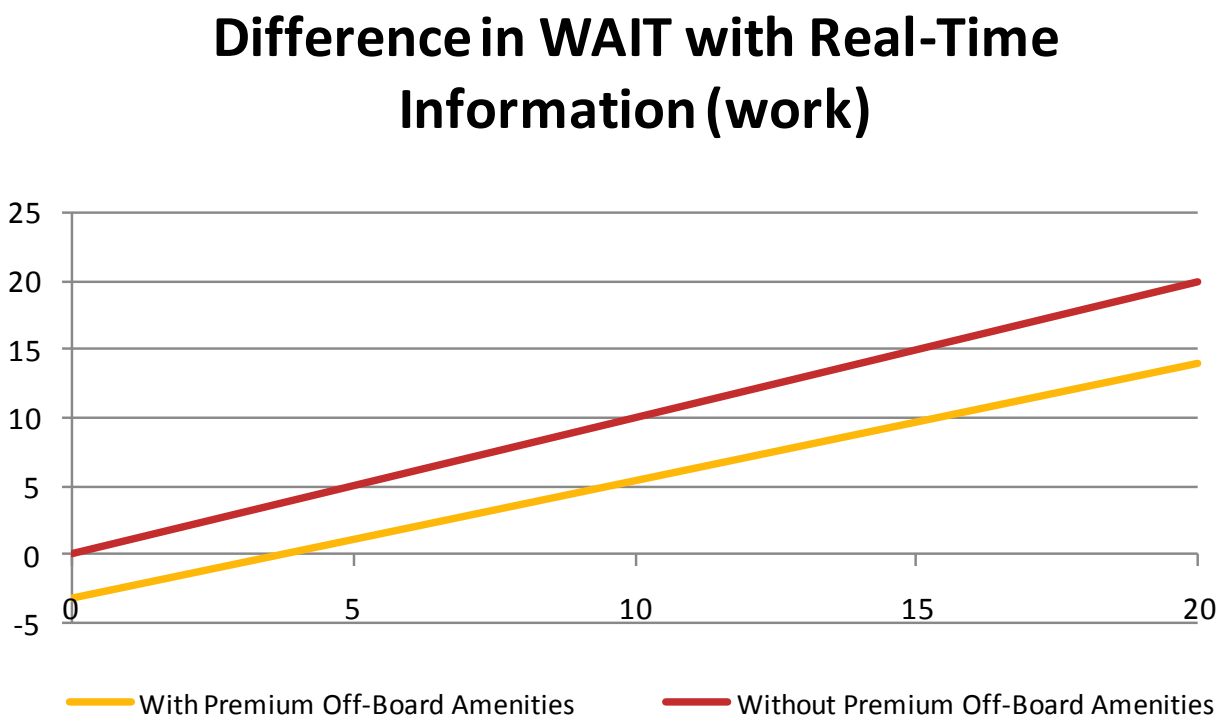
Interaction between IVTT and on-board amenities

- **The longer the trip, the more important premium on-board amenities become:**
  - At 30 minutes, premium on-board amenities are worth 8 minutes of travel time
  - At 60 minutes, premium on-board amenities are worth 12 minutes of travel time



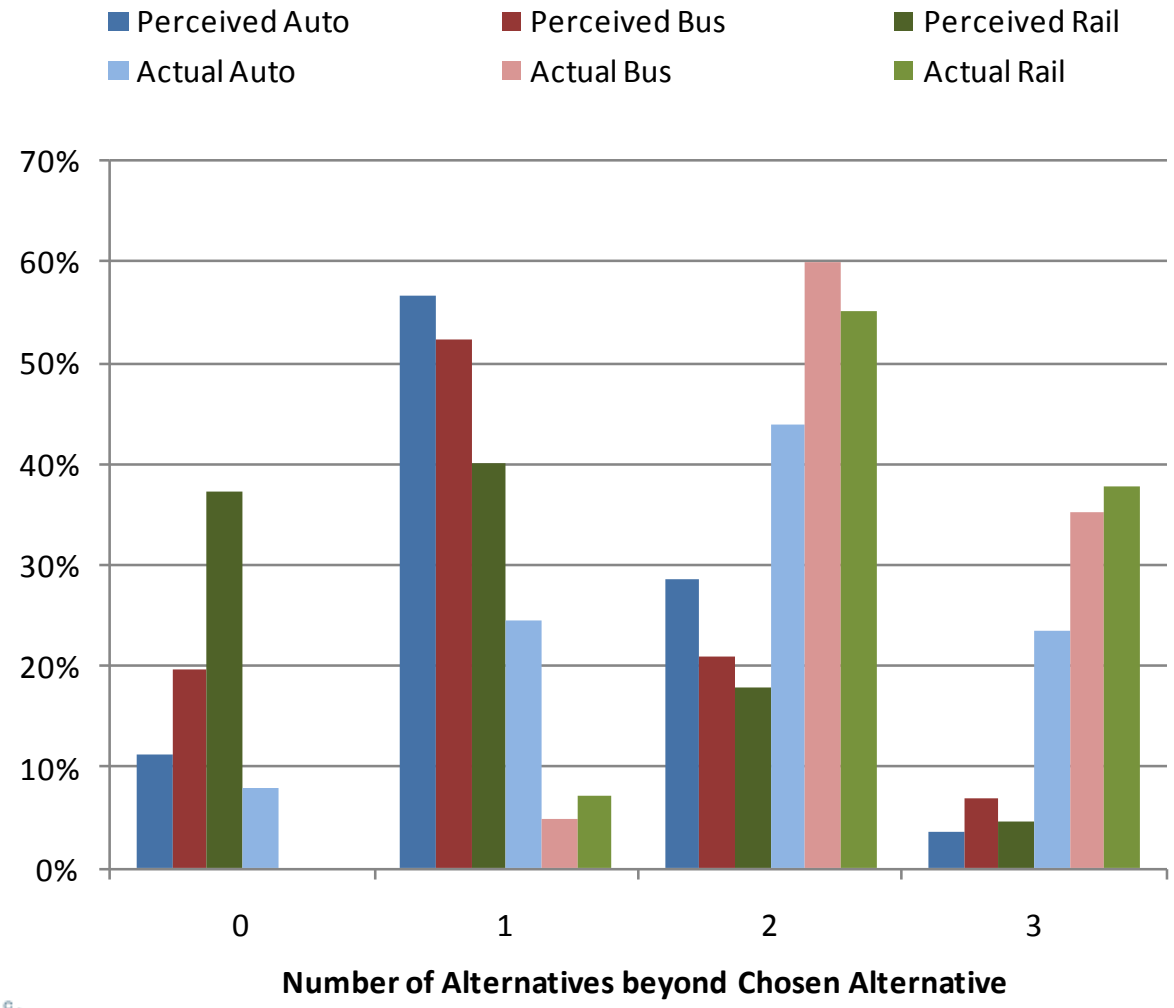
Interaction between Wait and Real-Time Info

- **The longer the wait, the more important real-time information becomes:**
  - At 10 minutes of wait time, real-time information are worth 5 minutes of travel time
  - At 20 minutes of wait time, real-time information are worth 6 minutes of travel time



Awareness of Specific Choices for a Trip

Travelers report fewer modes being available than the modeled representations of choice availability for a particular trip.



Key Findings for Awareness & Consideration

- **Traveler awareness of transit is**
  - Stronger for transit within walking distance
  - Limited in terms of full range of transit sub-mode options
  - Less for opportunities to drive to transit
  - Higher for travelers dependent on transit
- **Reported availability of modal alternatives is**
  - Lower than modeled (typically limited to 0 or 1 alternatives)
  - Lower for users who perceive dependence on current mode
- **Traveler perceptions of travel times are**
  - Higher for local bus users than rail or express bus users
- **Traveler consideration of transit is**
  - A limiting factor for riding transit beyond awareness
  - Affected by mode (reasons for not riding vary by mode)

All of these findings will be confirmed by more targeted survey research

Key Findings from Phase 1

- **Non-traditional attributes are significant in mode choice**
  - Reliability
  - Real-time transit information
  - Stop/station amenities
  - On-board amenities
  - The option to work from home
- **Travelers have an uneven and incomplete awareness of transit**
  - Spectrum of choices
  - Constraints on modal options
  - Stops or stations near home and park-and-ride lots short drive away
  - Inaccurate/different representation of travel time
- **Traveler attitudes also affect mode choice**
  - Inclination to use transit
  - Attitudes about service

These are the additional characteristics that affect choice of mode.

Bringing Results into Practice

- **Incorporation of non-traditional transit attributes**
  - Methods to develop these data in the base year
  - Methods to forecast non-traditional transit attributes
- **Choice set availability**
  - Traveler's awareness of modal options
  - Traveler's constraints on modal options
  - Traveler's consideration of modes
- **Representation of travel times**
  - Assumptions used in path building don't match traveler's perception
  - Conduct further analysis of travel time components

There is more work needed to quantify the impact of the individual characteristics for transit planning purposes.

Phase 2 Evaluation of Premium Transit Services

- Collect survey data in Chicago and Charlotte
- Develop choice set models to measure impact of awareness and consideration
- Update transit path building and network assumptions to match perception of travel times
- Include non-traditional attributes in mode choice models
  - reliability
  - real-time transit information
  - stop/station amenities (security, benches, cleanliness, proximity to services, shelter, lighting/safety)
  - on-board amenities (cleanliness, temperature, seating comfort, seating availability, and WiFi)
  - traveler attitudes
  - fare payment (new)

Chicago and Charlotte Survey Design

Background Questions	▪ Employment status ▪ Familiarity with transit	▪ Transit use frequency ▪ Types of trips made in past week by each mode
Reference Trip Characteristics	▪ DOW/TOD ▪ Trip duration ▪ Access/egress mode	▪ Car availability ▪ Trip costs ▪ Etc.
Reference Trip Transit Awareness	▪ Willingness to take transit in various situations ▪ Reference trip transit consideration	▪ Reasons transit wasn't used ▪ Awareness of transit options available (based on skims) ▪ Attitudes towards transit
Stated Preference Sections	▪ Standard Stated Preference with focus on mode choice and premium transit attribute bundles	▪ MaxDiff Plus with focus on detailed-level premium transit attributes
Demographics	▪ Standard demographics	

Questions?

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