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CHARACTERISTICS OF PREMIUM TRANSIT SERVICES THAT AFFECT MODE CHOICE

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- H-37 research team:
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Overview of TCRP H-37 study

Research project to understand of the range of determinants for mode choice behavior and to offer practical solutions for representing and distinguishing these characteristics in travel demand forecasting models

Principal findings

- Value of non-traditional transit service attributes on travelers' choice of mode is between 12 and 30 minutes of in-vehicle time
- Awareness and consideration and traveler attitudes may play a role but not definitive and unclear how modeled
- Models with non-traditional attributes coupled with attribute-driven choice structures can reduce arbitrary constants with little impact on model fidelity

Problem statement

Issues with traditional forecasting models used for transit forecasting

- Inadequate validation of:
  - Model inputs
  - Representation of transit trip-making patterns by origin/destination areas, traveler SE characteristics, mode of access, transit path-type
- Even when validated…
  - Time and cost appear to be only part of the picture
  - Poorly understood “silver bullets” (mode-specific constants) required to match observed ridership on fixed guideway routes
  - Transit sub-mode structures don’t always reflect array of choices

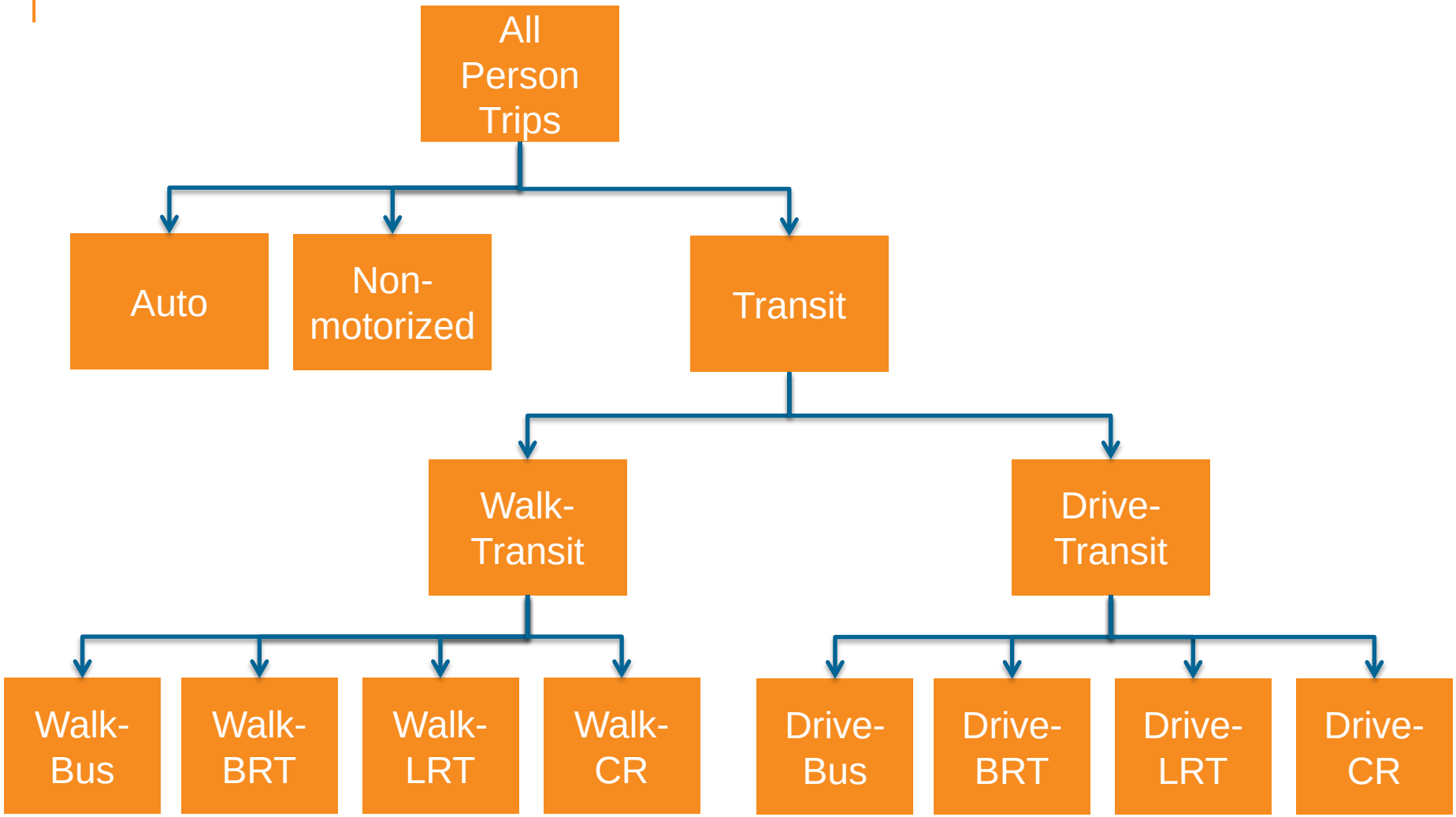
Problems with “silver bullets”

When is a fixed guideway mode “better”?

- Over-the-road coach with Wi-Fi versus standing on crowded subway train?
- Feeder bus-to-train versus no-transfer bus?
- Light rail versus commuter rail?

What about places with very high transit shares (e.g., Seattle) where travelers don’t appear to dislike bus?

Typical choice structure



Problems with conventional choice definitions

ACCESS MODE DEFINITION

- Conflate kiss-ride and park-ride

MODE DEFINITION AND HIERARCHY

- Typically rail being the highest, bus lowest
- Multimode trips classified at highest level (i.e., bus-rail = rail, often much better than bus-only)

ARBITRARY LABELS AND IMPEDANCES

- Based on vehicle technology, not service attributes
- Not all modes are equal; for example:
  - Premium bus service
  - Crowded, less comfortable rail service

These problems confound analysis of different transit improvement alternatives

Needs

- Understanding of underlying factors that contribute to the “silver bullet”
- Refined modal choice structures

Approach

LITERATURE REVIEW

- Awareness of transit services
- Transit service attributes
- Premium transit services in mode choice models

MARKET RESEARCH

- Surveys conducted in Salt Lake City, Charlotte, and Chicago
- Importance of transit attributes
- Traveler attitudes
- Awareness and consideration of transit services

ANALYSIS AND TESTING

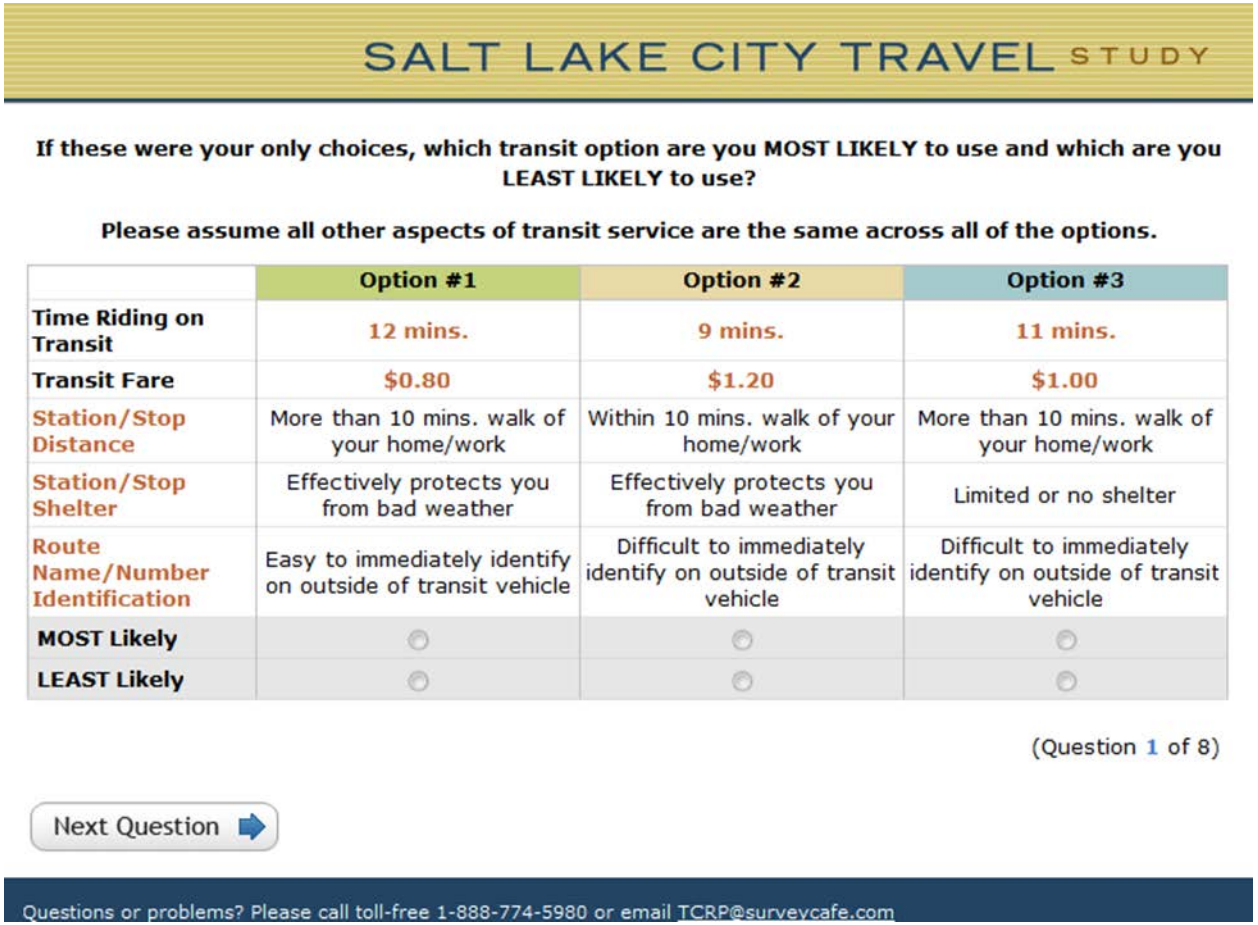
- Model estimation
- Application testing in Salt Lake City

Important non-traditional transit attributes

Research methods for valuing transit service

EXAMPLE TRADE-OFF EXPERIMENT

- Comfort
- Convenience
- Safety



SALT LAKE CITY TRAVEL STUDY

If these were your only choices, which transit option are you MOST LIKELY to use and which are you LEAST LIKELY to use?

Please assume all other aspects of transit service are the same across all of the options.

	Option #1	Option #2	Option #3
Time Riding on Transit	12 mins.	9 mins.	11 mins.
Transit Fare	$0.80	$1.20	$1.00
Station/Stop Distance	More than 10 mins. walk of your home/work	Within 10 mins. walk of your home/work	More than 10 mins. walk of your home/work
Station/Stop Shelter	Effectively protects you from bad weather	Effectively protects you from bad weather	Limited or no shelter
Route Name/Number Identification	Easy to immediately identify on outside of transit vehicle	Difficult to immediately identify on outside of transit vehicle	Difficult to immediately identify on outside of transit vehicle
MOST Likely	○	○	○
LEAST Likely	○	○	○

(Question 1 of 8)

Next Question

Questions or problems? Please call toll-free 1-888-774-5980 or email TCRP@surveycafe.com

Non-traditional transit service attributes

ON-BOARD AMENITIES

- Seating availability, seating comfort, temperature, cleanliness of a transit vehicle, productivity features.

STATION DESIGN FEATURES

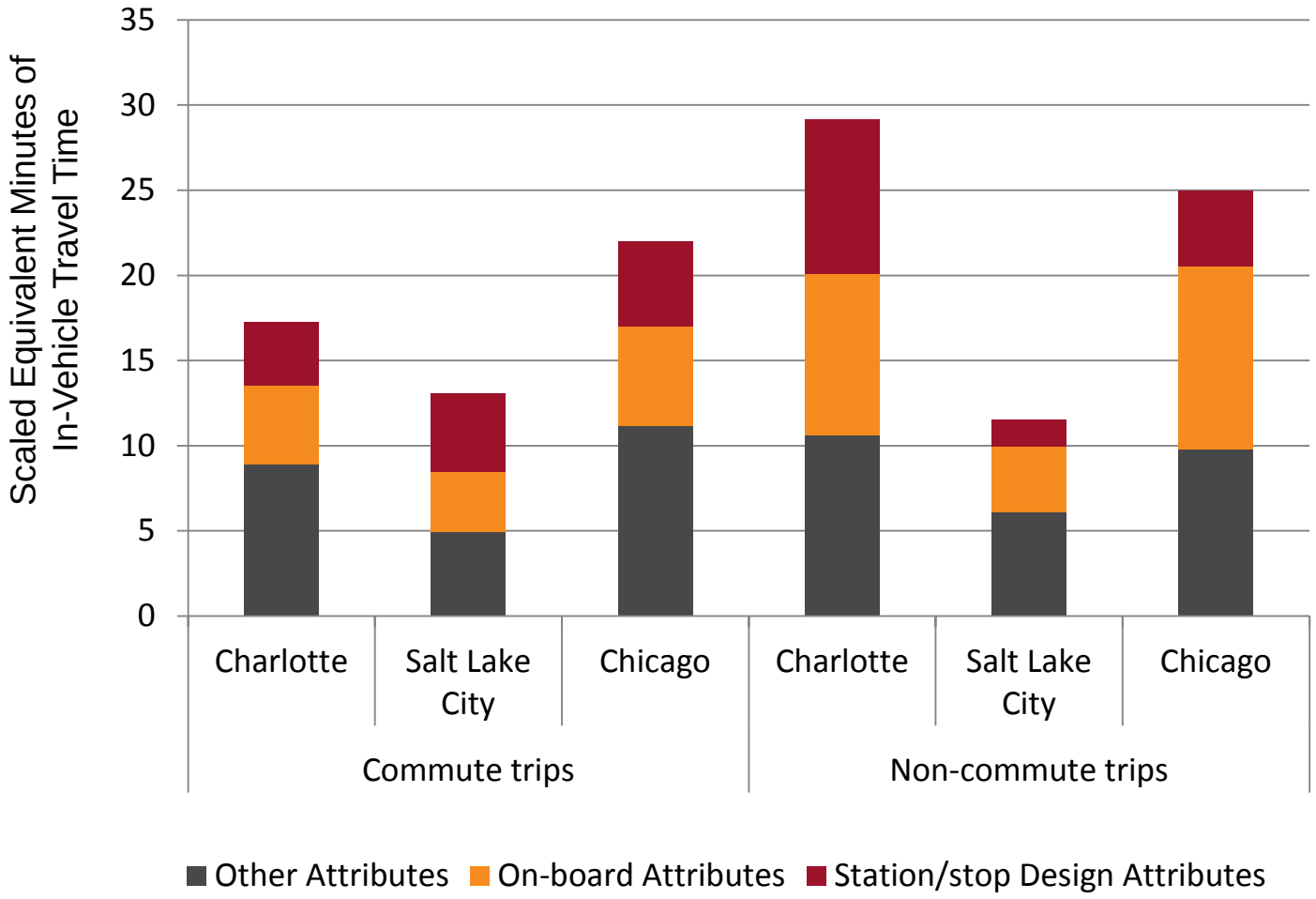
- Real-time information, security, lighting for safety, shelter, proximity to services, cleanliness of the station, benches.

OTHER FEATURES

- Route identification, reliability, schedule span, transit frequency, transfer distance, stop distance, parking distance, ease of boarding, fare machines.

Value of Non-Traditional Transit Service Amenities

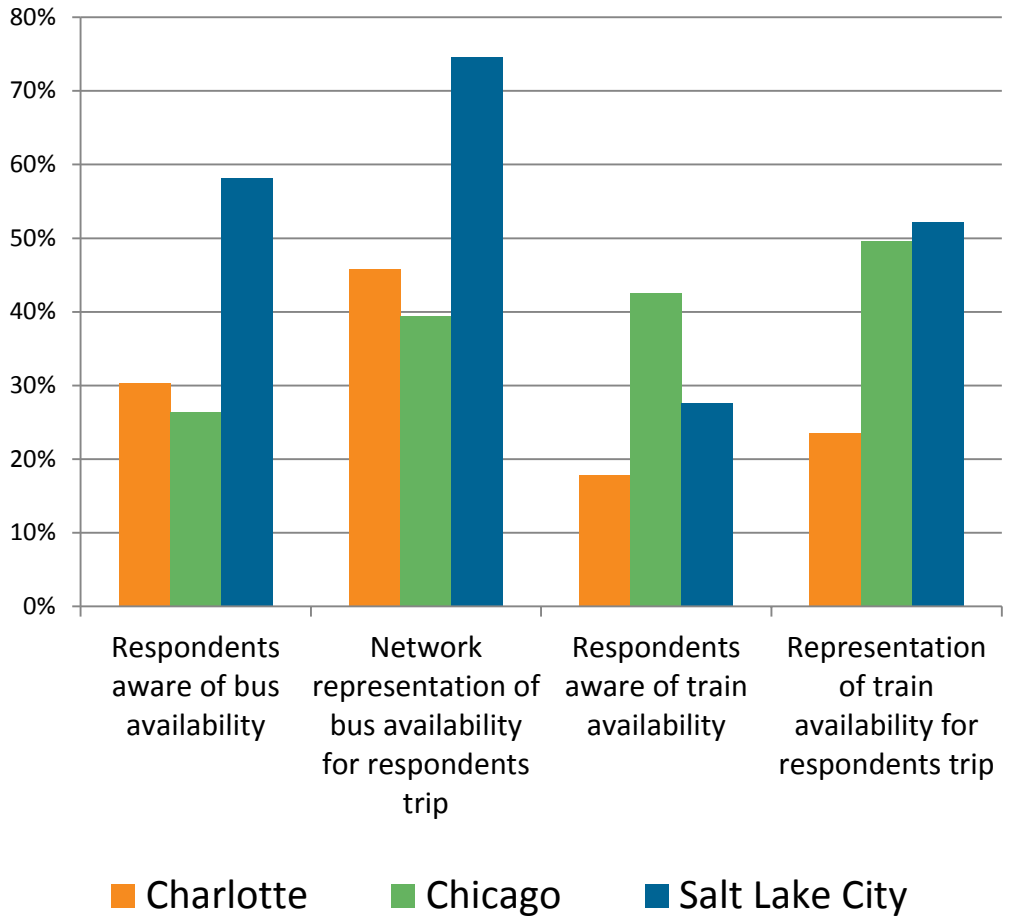
Variations between cities suggest that research might be useful in any new application



Awareness and Consideration of Transit Options

Awareness of Bus and Rail Modes

Typical models overstate the availability of transit options compared to respondent awareness



Consideration of Bus and Rail Modes

- When transit is available, consideration of rail higher than consideration of bus

		SURVEY RESPONDENTS				PERCENT OF TOTAL			
		BUS		TRAIN		BUS		TRAIN	
CHARLOTTE									
Considered	**Chosen**	380	191	252	156	55%	50%	71%	62%
	Not Chosen		189		96		50%		38%
Not Considered		310		102		45%		29%	
Total Available		690		354		100%		100%	
CHICAGO									
Considered	**Chosen**	333	207	619	429	56%	62%	83%	69%
	Not Chosen		126		190		38%		31%
Not Considered		259		126		44%		17%	
Total Available		592		745		100%		100%	

Key Findings for Transit Options

- Many travelers are not aware of or do not consider transit options represented by models as “available”
- Travelers are aware of, and consider, rail alternatives more often than bus in 2 out of 3 cases
- Models may be improved by limited choice sets prior to computing modal shares

Traveler Attitudes

Research into Traveler Attitudes

FACTOR ANALYSIS

Incorporate attitudinal factors into

- Awareness and consideration models
- Logit mode choice models

INTEGRATED CHOICE AND LATENT VARIABLES

Simultaneous estimation of attitudes and other latent variables (e.g., walk to transit, informed about transit, etc.) with mode choice

- Allows for forecasting of latent variables

CONCLUSIONS

Attitudes affect transit vs. auto choices but no relationship found for individual transit path choices

Implementation in Travel Models—Salt Lake City Example

Values of Premium Transit Service Attributes

BUNDLED ATTRIBUTE	PREMIUM SERVICE ATTRIBUTE	CRT	LRT	LOCAL	EXP	BRT	VALUE (MIN. OF IVTT)	SCALED VALUE (MIN. OF IVTT)
Station Amenities	Shelter	✓	✓	--	✓	✓	0.75	2.88
	Bench	✓	✓	--	✓	✓	0.38	1.45
	Lot Count	✓	✓	--	✓	--	0.00	0
Onboard Amenities	On-Board Seating Availability	✓	✓	✓	--	--	1.81	2.90
	Productivity Features	✓	--	--	✓	--	0.82	1.32
	Vehicle Cleanliness	✓	--	--	✓	✓	0.62	0.99
Other Service Features	Reliability	✓	✓	--	--	✓	5.12	7.79
	Midday Schedule Span	✓	✓	✓	--	✓	0.32	0.49
	Evening Schedule Span	✓	✓	✓	--	✓	0.32	0.49
	Vehicle Ease of Boarding	✓	✓	--	--	✓	0.14	0.22
	Fare Machines	✓	✓	--	--	✓	0.69	1.06
IVTT with Premium (Percent Reduction in IVT)		21%	21%	0	21%	21%		
Premium Benefit (Minutes)		11.0	9.5	2.5	2.6	8.3		
Scaled Premium Benefit (Minutes)		19.6	17.3	3.9	6.6	15.4		
Relative Non-Premium Service Boarding Penalty		0	2.3	15.7	13	4.2		

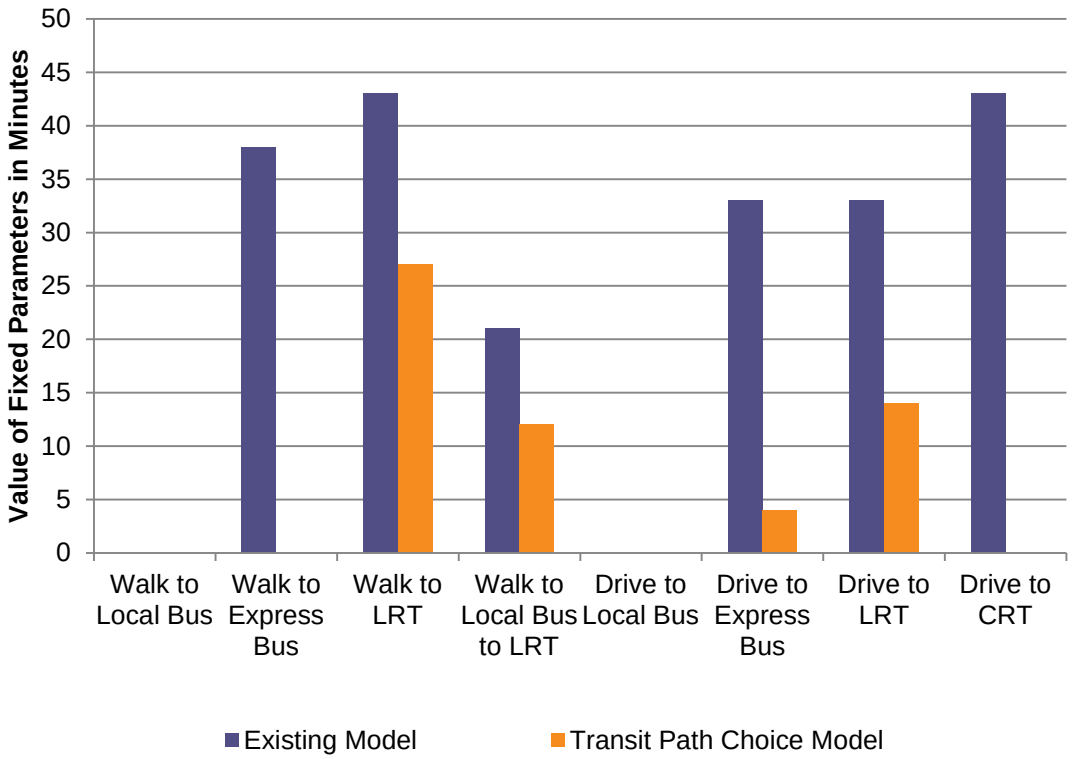
Path Building Parameters for the Transit Path Choice Model

WALK PATH	DRIVE PATH	TRAVELER PREFERENCES	TRANSFER PENALTY	ACCESS/ EGRESS TIME	WAIT TIME	NON PREMIUM SERVICE BOARDING PENALTY	PREMIUM SERVICE IN VEHICLE TIME
1		Shorter Access Times, Premium Service	0	2	1	0.5	1
	1	Shorter Access Times, Premium Service for Longer Trips	0	2	1	1	0.5
2	2	Direct, Frequent Service	10	1	2	1	1
3	3	Frequent, Non-Premium Service	0	1	2	1.5	1

Reducing Impacts of Fixed Parameters

COMPARISON FOR EXAMPLE TRANSIT TRIPS

- Alternative Specific Constants
- Transfer Penalties
- Direct Walk Times
- Boarding Penalties



Implementation Lessons Learned

PATH CHOICES

- Enumerating path choices based on observed behavior improved accuracy
- Revising mode choice model nesting structures improved the representation of competitive services and reduced the reliance on modal labels

ALTERNATIVE SPECIFIC CONSTANTS

- Accounting for all transit service attributes reduced the influence of alternative specific constants in the mode choice models

Benefits for Forecasting

Accounting for Non-Traditional Transit Service Attributes

VALUE

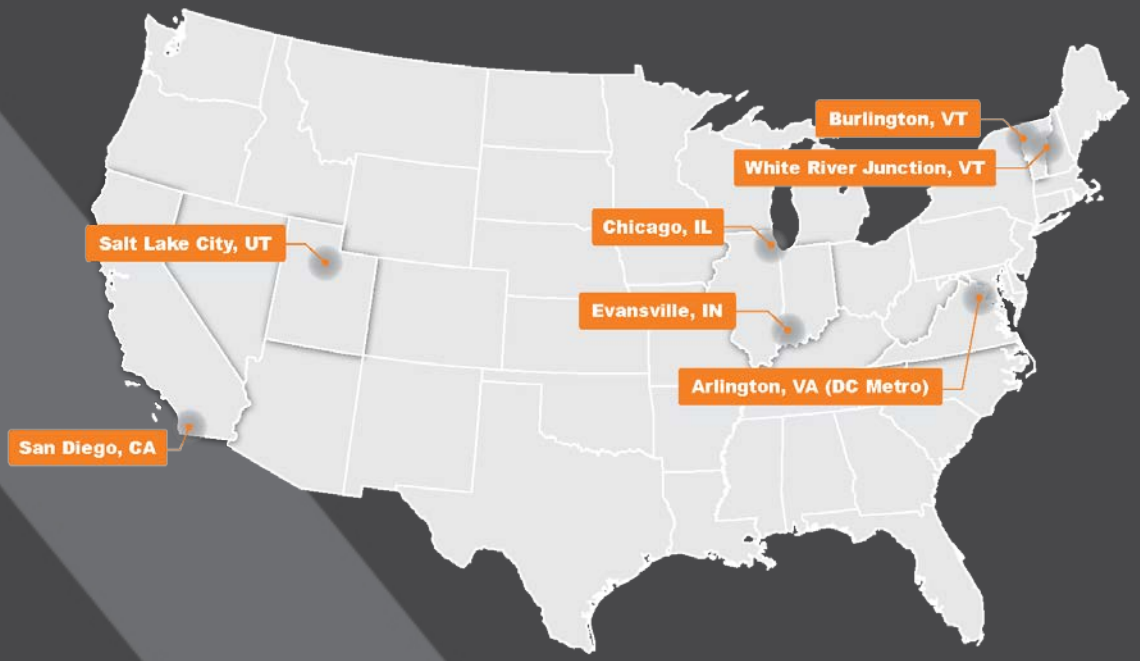
- Premium service attributes account for a range of 17-29 minutes of in-vehicle travel time

MODEL STRUCTURE

- Enumerating path choices based on observed behavior improves the choices provided for each access mode
- Revising mode choice model nesting structures improves the representation of competitive services

BIAS

- These improvements effectively reduce the influence of alternative-specific constants in the mode choice models



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