THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

0-6766-P2

WORKSHOP PRESENTATION

TxDOT Project 0-6766: A Generic Mode Choice Model Applicable for Small and Medium-Sized MPOs

DECEMBER 2013

Performing Organization:	**Sponsoring Organization:**
Center for Transportation Research	Texas Department of Transportation
The University of Texas at Austin	Research and Technology Implementation Office
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Performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.
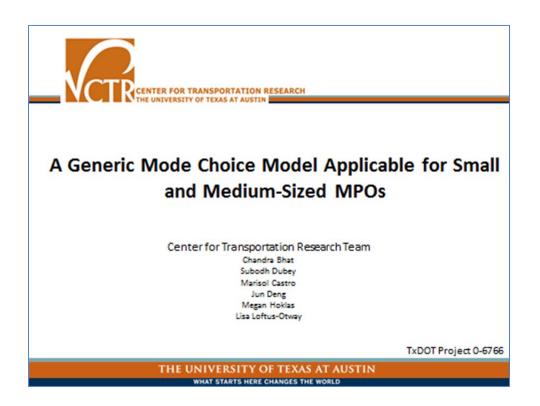
INTRODUCTION AND OVERVIEW

On December 18, 2013, the research team hosted a workshop at CTR to gather feedback on and generate discussion of the mode choice model that was developed.

Attendees included the project monitoring committee (PMC) and TTI personnel who staff a help desk for TxDOT's Transportation Planning and Programming Division.

At the same time the PMC and research team followed up with a close-out meeting for the project.

Following are the PowerPoint slides presented at the session.

Project Introduction

The goal of this project was to

- Incorporate a mode choice component into the Texas Package Suite of Travel Demand Model

- Develop an operational stand-alone generic mode choice model

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Why Mode Choice is needed?

- With population growth projections increasing, it has become necessary to examine mulit-modal solutions to manage growing auto travel demand

- Allows for evaluation and prioritization of multimodal projects at the regional level

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Mode Choice Models

- Analyze alternative transportation modes of the area (i.e. carpooling, public transportation, bicycling/walking)
- Can be estimated at
  - Disaggregate level
    - Individual Decision-maker Choices
  - Aggregate level
    - TAZ to TAZ Modal Shares

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Data Requirements

Demographic Variables
- Household Size
- Income Levels

Trip Variables
- Purpose of Trip
  - Focus on Home-based Work Trips
- Mode of Trip (Walk, DA, SR_2, TR, Bike)
- Origin-Destination of Trip at TAZ Level

Travel System Variables
- Total Travel Time
- Out-of-Vehicle Travel Time
- In-Vehicle Travel Time
- TAZ-TAZ Distance
- Total Travel Cost

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Create IVTT DA & SR

Generating IVTT Skims for different Mode using TRANSCAD

- Drive Alone and Shared Ride
- Transit (Tricky one!)

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WHAT STARTS HERE CHANGES THE WORLD

Create OVTT Skims

Generating OVTT Skims for different Mode using TRANSCAD

- Drive Alone and Shared Ride (Area based assumption)
- Bike and Walk (restrict freeways and highways)
- Transit (Measure the distance to stop from centroid)

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Create Distance Skim

Generating Distance Skims for different Mode using TRANSCAD

- Drive Alone and Shared Ride (Based on shortest path)
- Bike and Walk (Based on shortest path)
- Transit (Can use straight line distance based on coordinates)

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Create Cost Skim DA,SR &Transit

Generating Cost Skims for different Mode using TRANSCAD

- Drive Alone and Shared Ride (Assume per mile gas cost)
- Transit (Available from bus operators website)

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Assumptions

Typical OVTT Value for DA/SR

Generating OVTT Skims for DA/SR Mode

- Drive Alone and Shared Ride

Workplace location area type	MPO	
	Lincoln MPO	Metro MPO
Central business district (CBD)	1.5	5.0
Other business districts	1.0	2.0
Residential	1.0	2.0
Rural	0.75	2.0

CAMPO Assumption

Generating OVTT Skims for DA/SR Mode

- Drive Alone and Shared Ride

Area Type	MPO
	CAMPO MPO
Central business district (CBD)	1.5
CBD Fringe	1.25
Urban and Suburban	1.00

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IVTT Transit

Generating IVTT Skims for Transit Mode

- We use the travel times reported at bus operators website

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Assumption(OVTT Transit)

Generating OVTT Skims for Transit Mode

- Distance between centroid and stop
- Get the time using average walking speed (3 mph)

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Assumption(OVTT Walk and Bike)

Generating OVTT Skims for Walk and Bike
- Restrict highway links
- For Ex: Lubbock (US-82,US84,Us-62,I-27,US-87)
- Longview (IH-20,US-259,US80)
- Get the shortest path
- Get the time using average walk (3 mph) and bike (11 mph) speed

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Distance DA/SR

- Using Multiple Shortest path in TRANSCAD
- Concurrent generation of distance skim during time skim generation

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Distance Transit

- We used the straight line distance based on coordinates
- Network file needs to be more detailed

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Travel Cost Skim

- Assumed per mile gas cost : $0.25 for DA/SR
- For transit, values were obtained from bus operators website
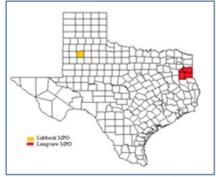- Longview : $1.25
- Lubbock: $1.75

Model Estimation Examples

- Developed mode choice models for two Texas MPOs based on data availability
  - Lubbock
    - Medium-Sized MPO
  - Longview
    - Medium-Sized MPO

Lubbock MPO
Longview MPO

Modal Share for HBW trips

Mode	Lubbock		Longview	
Walk	0	0	4	0.41
Drive Alone	1556	98.05	944	97.72
Shared Ride (2)	30	1.89	15	1.55
Transit	1	0.06	0	0
Bike	0	0	3	0.31

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Transit Accessibility

- Lubbock : Only 43 observations
- Longview : Only 3 Observations

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Transit Route Description

- Lubbock
  - 9 Bus Routes
  - Average of 5 stops per route
- Longview
  - 5 Bus Routes
  - Average of 5 stops per route

Mode Choice Model

- MNL model
- Explanatory Variables :
- Household size (1, 2&3 , >4), Income (<20K, 20K-50K,>50K)
- In-Vehicle travel time, Out of Vehicle Travel time, Travel cost, Travel Distance
- Mode : Walk, Drive Alone, Shared Ride(2), Transit, Bike

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Longview

Parameters	Walk	Drive Alone	Shared Ride	Transit	Bike
Alternative Specific Constant	----------	0.430 (0.89)	-3.71 (-4.42)	-0.069 (-0.72)	-0.288 (-0.98)
Household Annual Income (Less Than 20K is the base category)					
Income between 20K and 50K	----------	1.490 (1.94)	1.490 (1.94)	----------	----------
Income between 50K and 75k	----------	1.160 (19.53)	1.160 (19.53)	----------	-2.190 (-2.89)
Income greater than 75k		1.260 (21.79)	1.260 (21.79)		-2.280 (-3.01)
In-Vehicle Travel Time (Min)	----------	----------	----------	-0.599 (-0.95)	----------
Out-of-Vehicle Travel Time (Min)	----------	----------	----------	-0.688 (-1.94)	----------
Travel Distance (Miles)	-1.000 (-3.73)	----------	----------	----------	-1.000 (-3.73)
Travel Cost (Dollars)	----------	----------	----------	-1.320 (-1.05)	----------

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Value of Travel Time

- Lubbock : 24.34 dollars/hour
- Longview : 27.23 dollars/hour

Forecasting Tool

- Works at group (household size and income group) and TAZ level
- Calculate share for each household size and income combination
- Take the weighted average to get the TAZ level mode share

A Generic Mode Choice Model Applicable for Small and Medium-Sized MPOs

December 18, 2013

Final Meeting

Objective

•To develop an operational stand-alone generic mode choice model for Texas urban regions

(1) Identify the circumstances in which the implementation of a mode choice model in an urban area would be appropriate

(2) Develop an operational generic mode choice model that includes a blueprint of estimation steps as well as application steps for the MPOs that are supported by TPP in model development efforts

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TASKS

Task 1:	Synthesize the available literature on mode choice models and develop an approach to assess the appropriateness of implementing a mode choice model.	✓
Task 2:	Develop forecasting approach and overall model design recommendations incorporating mode choice component.	✓
Task 3:	Identify available sources for data, and develop protocols for generating data.	✓
Task 4:	Prepare data for mode choice estimation in one small-sized urban area and one medium-sized urban area.	✓
Task 5:	Estimate multinomial logit (MNL) and nested logit (NL) mode choice models for the two MPOs identified in Task 4.	✓
Task 6:	Develop a stand-alone generic mode choice model and build a prototype of this model within Excel.	✓
Task 7:	Conduct a workshop to present the mode choice model estimation techniques and model application procedure.	✓

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Project Schedule and deliverables

- Time frame: November 2012 – December 2013
  - August 2013: framework development (Task 1-3)
  - December 2013: framework application and workshop (Tasks 4-7)

- Deliverables
  - Excel file and user documentation guide
  - Workshop (Nov-Dec 2013)
  - Final reports: February, 2014

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Questions?

THANKS.

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