

NCHRP 8-61 Travel Demand Forecasting: Parameters and Techniques

presented to

Tennessee Model Users Group

Prepared by

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Presentation Outline

- Project Overview
- Analysis of NHTS Data
- Data from existing MPO models
- What's in the guidebook?
- Next Steps
 - NCHRP 8-84: Rural and Long-Distance Transferable Parameters

Project No. NCHRP 8-61

Copy No:

TRAVEL DEMAND FORECASTING:
PARAMETERS AND TECHNIQUES

PRELIMINARY DRAFT FINAL REPORT

Prepared for

National Cooperative Highway Research Program
Transportation Research Board
National Research Council

TRANSPORTATION RESEARCH BOARD
NAS-NRC
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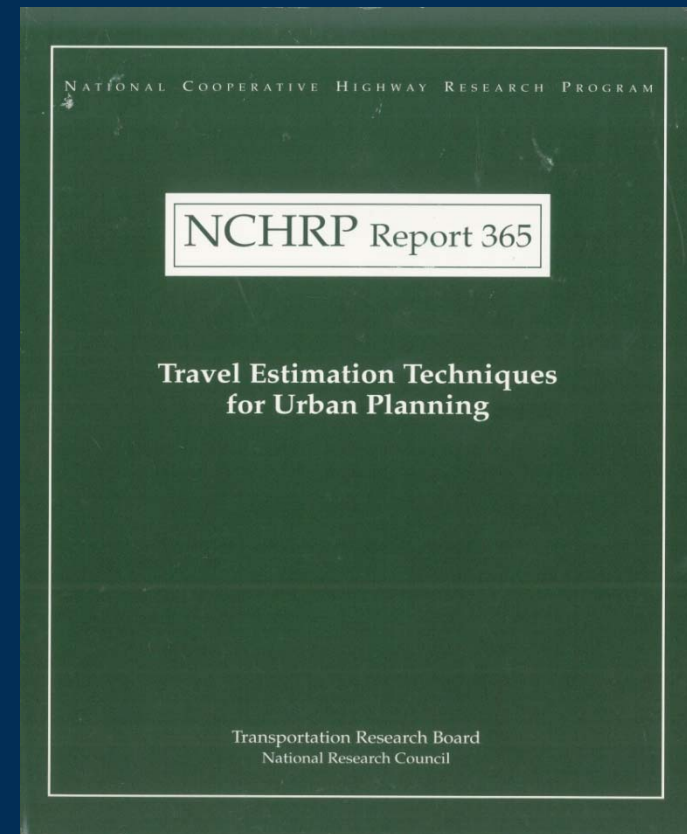
Cambridge Systematics, Inc.
Vanasse Hangen Brustlin, Inc.
Gallop Corporation
Dr. Chandra R. Bhat
Shapiro Transportation Consulting, LLC
Martin/Alexiou/Bryson, PLLC

October 2011

Project Overview

Background

- **1978 –NCHRP Report 187**
 - **Quick Response Urban Travel Estimation Techniques and Transferable Parameters**
- **1998 – NCHRP Report 365**
 - **Travel Estimation Techniques for Urban Planning**
- **2011 – Project 8-61**
 - **Travel Demand Forecasting: Parameters and Techniques**



Project Overview

Project Panel, Staff, and Research Agency Team

NCHRP Staff for Project 8-61

Nanda Srinivasan, Sr. Pgm. Officer
Lori Sundstrom, Sr. Pgm. Officer

Project 8-61 Panel

Thomas Kane (Chair)
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Cambridge Systematics, Inc.

In Association With

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Principal Investigator

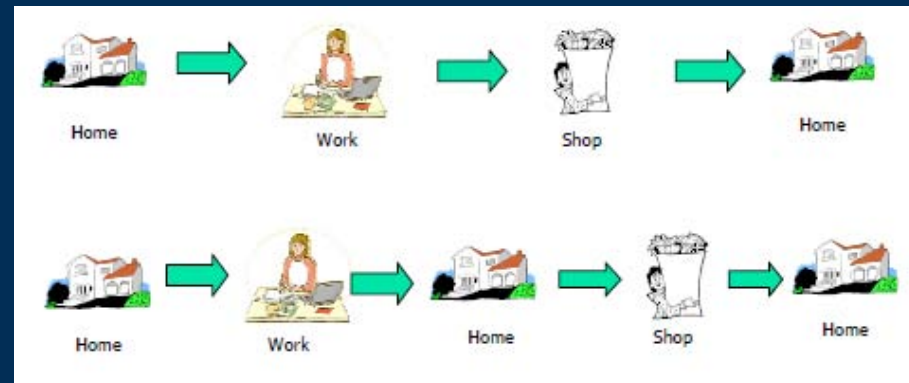
Thomas Rossi

Project Overview

Objectives

- **Revise and Update NCHRP Report 365**

- Current travel characteristics
- Guidance on forecasting
 - Procedures
 - Applications



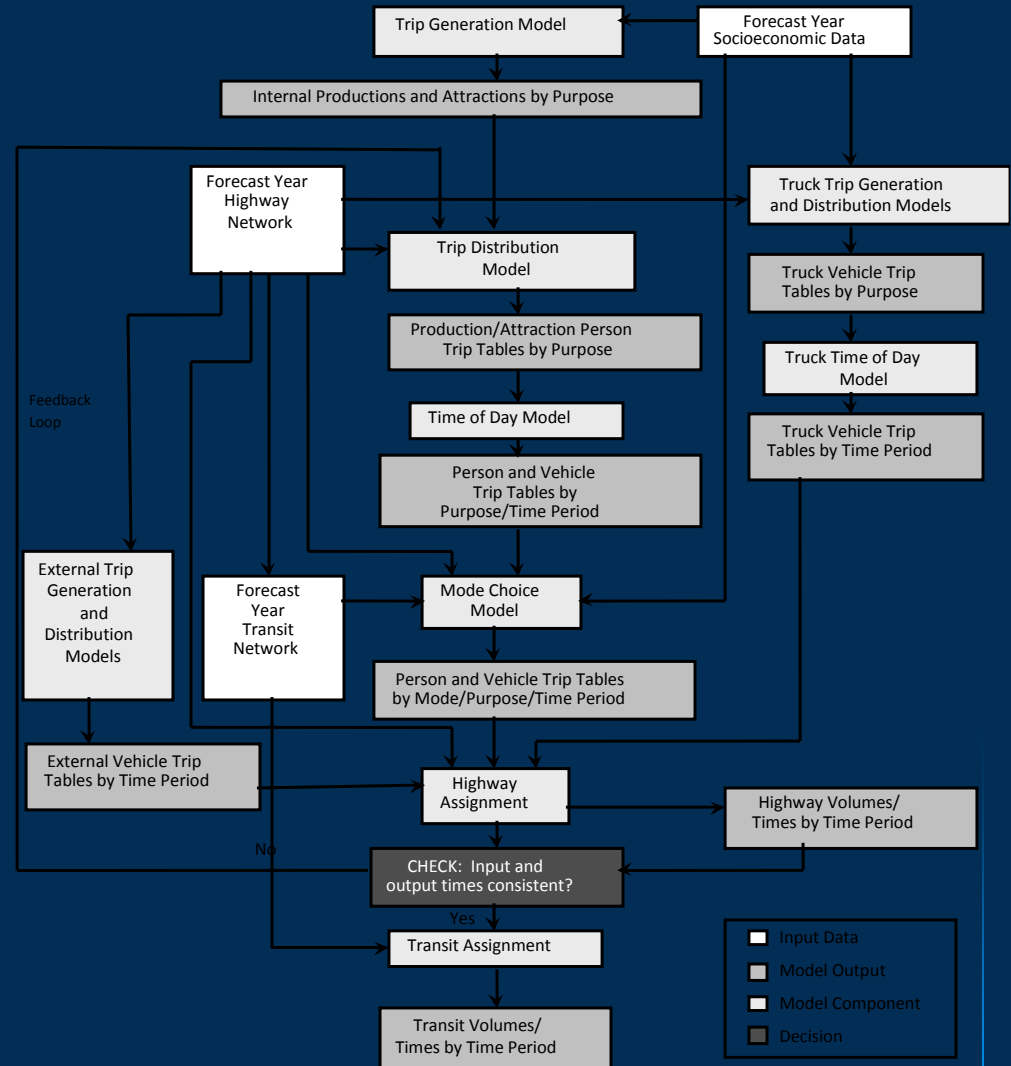
- **Develop User-Friendly Guidebook**

- Range of approaches
 - Application of straightforward techniques
 - Optional use of default (transferable) parameters
- References to more sophisticated techniques
- Broad range of transportation planning issues

Project Overview

Status to Date

- Analysis of 2001 NHTS data
- Analysis of MPO model documentation
- Guidebook finalized
- Case studies completed/documentated



Analysis of NHTS Data Process

- **Information developed for four variables of interest**
 - **Person trip production rates**
 - Per household by trip purpose
 - **Reported average trip durations**
 - By mode and trip purpose
 - **Time of day of travel distributions**
 - By trip purpose
 - **Vehicle occupancy**
 - By trip purpose
- **Variables selected based on potential for transferability**

Analysis of NHTS Data Classifications

- **Trip purposes used for data summaries**
 - Home based work
 - Home based school
 - Home based other
 - Non-home based

➤ Home based non-work
- **Urban area population classifications (from 2009 NHTS)**
 - 1 million + with subway/rail; 1 million + without subway/rail
 - 500k to 1 million
 - 200k to 500k
 - 50k to 200k
 - Not in urban area

Analysis of NHTS Data

Sample Tabulations

- **Sample trip production tabulation (2009)**
Home based work - MSA population less than 250,000

Autos	Workers				Avg
	0	1	2	3+	
0	0.0	1.2	2.3	1.6	0.6
1	0.0	1.0	1.7	4.7	0.7
2	0.0	1.3	2.5	2.8	1.7
3+	0.0	1.2	2.5	3.7	2.3
Avg	0.0	1.1	2.4	3.6	1.5

Analysis of NHTS Data

Sample Tabulations

- **Sample trip length tabulation (2009)**
Home based work – Average travel time in minutes

MSA Population ¹⁸	Auto	Transit	Non-Motorized	All Modes
Greater than 3 million	29	56	18	31
Between 1 and 3 million	24	48	19	25
Between 500,000 and 1 million	24	53	14	24
Between 250,000 and 500,000	21	30	11	21
Less than 250,000	20	59	11	20
Not in MSA	21	57	8	21
All trips	25	55	15	26

Data from Existing MPO Models Process

- **Information from over 70 MPOs**
 - **Small, medium, large**
 - **Direct contact or publicly available reports**
 - **Information collected**
 - **Model parameters**
 - ◆ Trip attraction rates
 - ◆ Friction factor parameters
 - ◆ Mode choice parameters
 - ◆ Volume-delay function parameters
 - ◆ ...
 - **Model methods used**

Data from Existing MPO Models

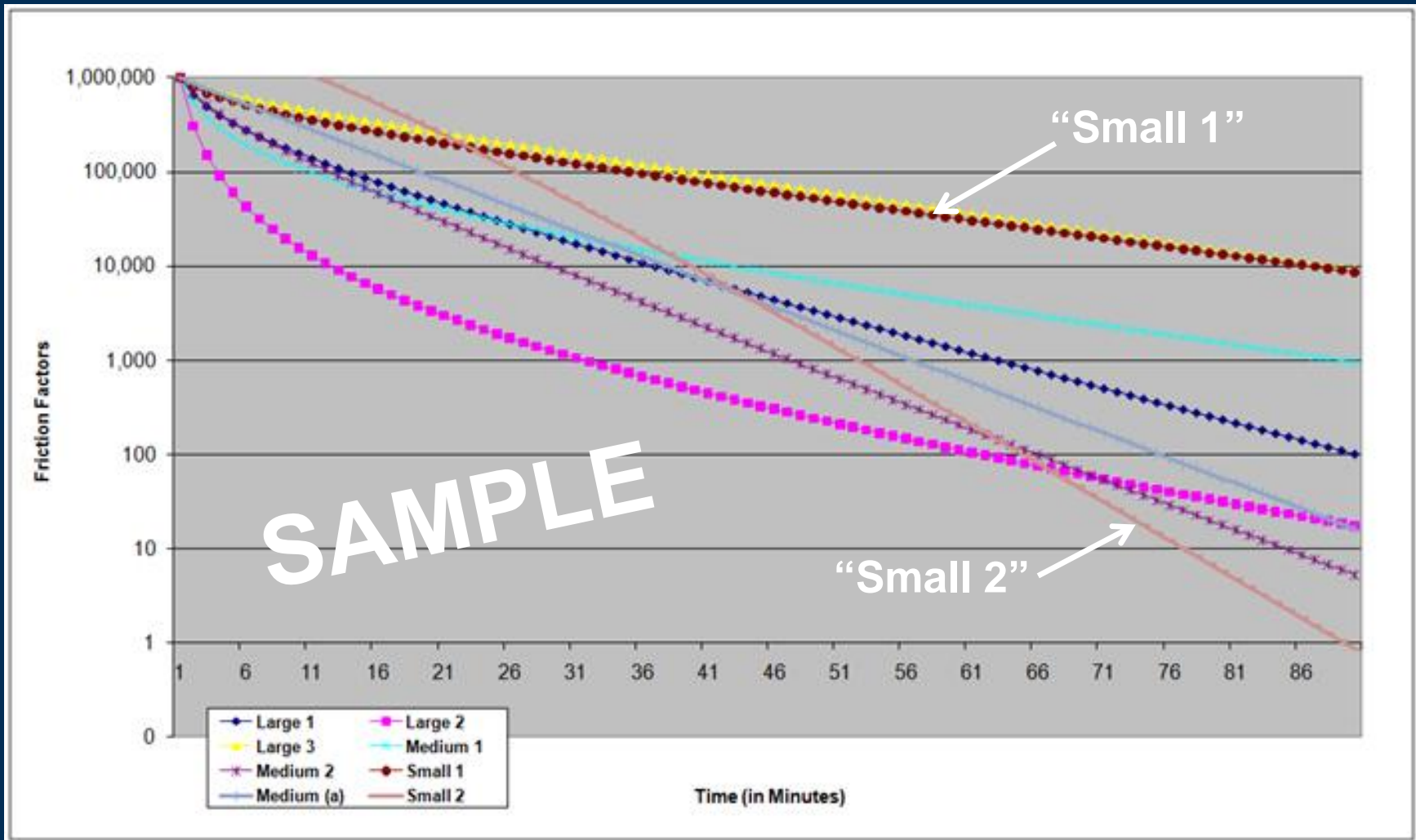
Sample Tabulation

- Sample gamma function gravity model parameters (home based work)

	“b”	“c”
Large MPO 1	0.503	-0.078
Large MPO 2	-1.650	-0.040
Large MPO 3	-0.156	-0.045
Medium MPO 1	-0.812	-0.037
Medium MPO 2	-0.388	-0.117
Medium MPO 3	-0.020	-0.123
Small MPO 1	-0.265	-0.040
Small MPO 2	0.850	-0.200

Data from Existing MPO Models

Sample Gamma Function Comparison (Home Based Work)



What's in the Guidebook?

- **Chapter 1. Introduction**
 - Purpose, objectives, and roadmap
 - Summary of modeling process
 - How parameters used
- **Chapter 2. Planning Applications Context**
 - Planning context affect on model
 - Examples from urban areas

What's in the Guidebook? (continued)

● Chapter 3. Development of Data

● Purposes

- Model development
- Model validation
- Model application

● Considerations

- Limitations of typical data
- Primary and secondary data sources
- Conversion of data from secondary sources
- Network coding procedures

Table 3.2 ACS Data Releases

Data Product	Population Threshold	Geographic Threshold	Planned Year of Release			
			2010	2011	2012	2013
1-year Estimates	65,000+	PUMAs, counties, large cities	2009	2010	2011	2012
3-year Estimates	20,000+	Counties, large cities	2007-2009	2008-2010	2009-2011	2010-2012
5-year Estimates	All areas*	Census tracts, block groups in summary file format	2005-2009	2006-2010	2007-2011	2008-2012

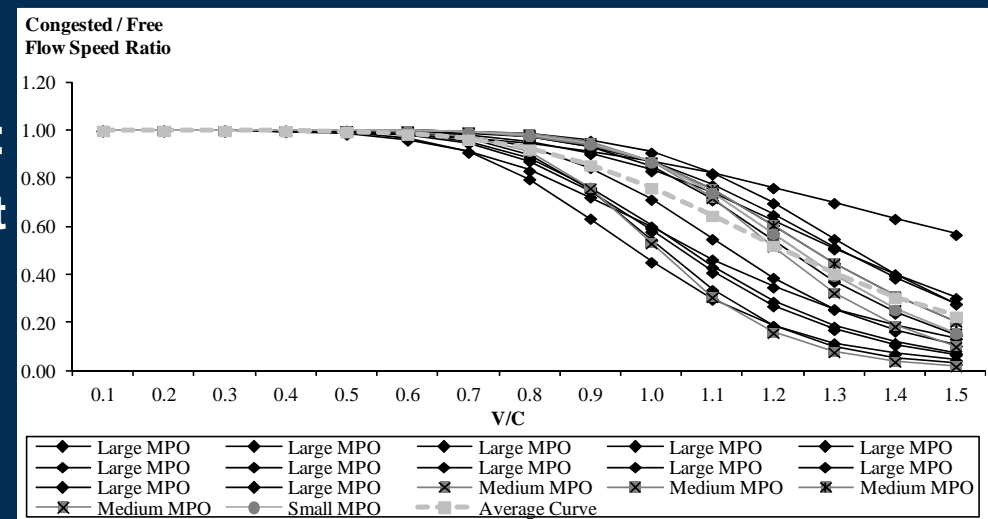
Source: U.S. Census Bureau.

*Five-year estimates will be available for areas as small as census tracts and block groups.

What's in the Guidebook? (continued)

● Chapter 4. Model Components

- Discusses each model component
- Each subsection presents:
 - A brief description of best practice(s)
 - Basis for development of parameters
 - Parameters classified by urban area category
 - Explanations of use in model
 - ◆ Estimation
 - ◆ Validation
 - Parameter transfer



What's in the Guidebook? (continued)

Chapter 4 subsections

- Vehicle Availability
- Trip Generation
- Trip Distribution
- External Travel
- Mode Choice
- Automobile Occupancy
- Time-of-Day Characteristics
- Truck/Freight Modeling
- Highway Assignment
- Transit Assignment

What's in the Guidebook? (continued)

Chapter 4 appendices

- **% of HHs by number of vehicles by U.S. metro area**
- **Coefficients for logit vehicle availability models**
 - 1 vehicle HHs
 - 2 vehicle HHs
 - 3+ vehicle HHs
- **Mean trip length in minutes by purpose and mode by population range**
- **Trip production rates by population size and purpose:**
 - HBW
 - HBNW
 - NHB
 - HBSC
 - HBO (nonwork, nonschool)
- **Time-of-day distributions by purpose and direction**

What's in the Guidebook? (continued)

- Chapter 5. Model Validation Process
 - Validation overview
 - Consistent with other sources
 - Appropriate out-references
 - Not duplication of existing references
 - Basic guidance
 - Focus on information in the guidebook

Table 5.8 Comparison of Shares of Trips by Trip Purpose

Urbanized Area Population	Percents of Daily Person Trips by Trip Purpose								
	NCHRP Report 187 ^a (Published 1978)			NCHRP Report 365 ^a (Published 1998)			2009 NHTS Data ^b		
	HBW	HBNW	NHB	HBW	HBNW	NHB	HBW	HBNW	NHB
50,000 to 100,000	16	61	23 ^c	20 ^c	57 ^c	23 ^c	15	54	31
100,000 to 200,000	20	57	23 ^c	20 ^c	57 ^c	23 ^c	15	54	31
200,000 to 500,000	20	55	25 ^c	21 ^c	56 ^c	23 ^c	15	54	31
500,000 to 1,000,000	25	54	21 ^c	22	56 ^c	22 ^c	14	56	30
1,000,000 to 3,000,000	25	54	21 ^c	22 ^c	56 ^c	22 ^c	14	56	30
More than 3,000,000	25	54	21 ^c	22 ^c	56 ^c	22 ^c	14	56	30

Notes: a. Shares by purpose are based on person trips in motorized vehicles.
 b. Shares by purpose are based on person trips by all modes.
 c. Because of differences between urban area categories in the three reports, the rates shown were chosen from the closest matching category.

Sources: NCHRP Report 187, NCHRP Report 365, 2009 NHTS.

What's in the Guidebook? (continued)

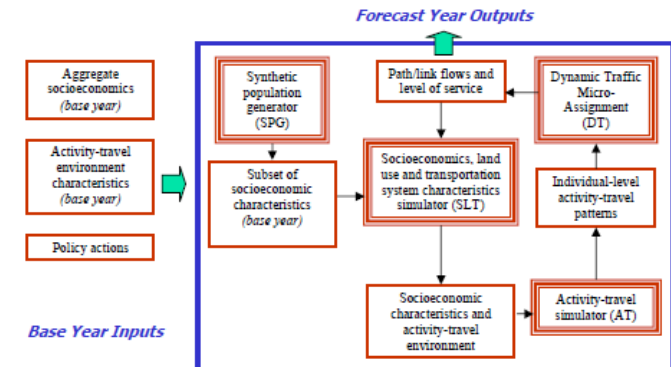
● Chapter 6. Advanced Modeling Practices

- Overview
- Tour and activity based approaches
- Traffic microsimulation

● Chapter 7. Case Study Application(s)

- Two studies
 - Smaller urban area with little transit
 - Larger area with transit
- Illustrate use of the information from Chapters 4 and 5
- Draw on concepts presented guidebook
 - Similar to approach in NCHRP Report 365

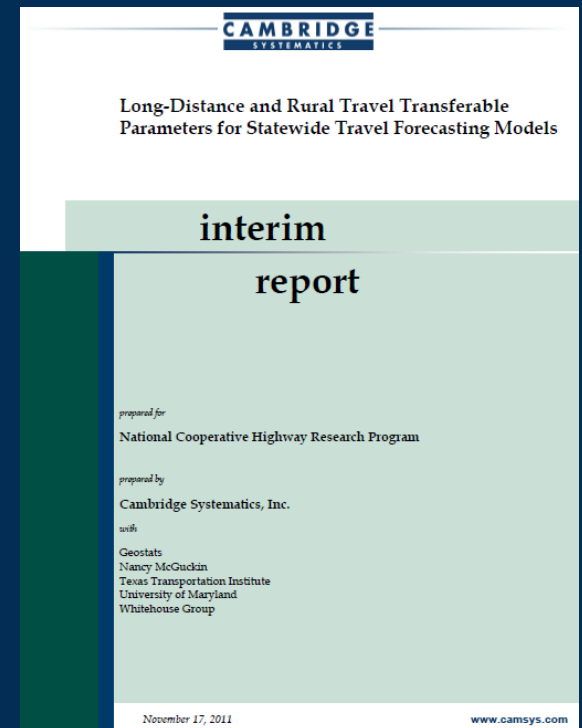
Figure 6.5 An Integrated Model System



Source: Modified from Eluru et al., 2008.

Next Steps

- **Publication of Final Report**
- ***Related study in progress – NCHRP 8-84, Long-Distance and Rural Transferable Parameters for Statewide Models***
 - **Conduct Review of Long-Distance Data Sources - *complete***
 - **Review of Statewide Model Long-Distance Trips - *complete***
 - **Prepare Interim Report - *complete***
 - **Implement Approved Analytical Plan - *underway***
 - **Prepare Guidebook with Executive Summary – *complete by Summer 2012***



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