

# SPECIAL GENERATORS

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Thoughts and Strategies for Travel Demand  
Modeling

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# Need for Special Generators

- What are Special Generators?

“[M]ajor land uses for which the standard trip generation and distribution models are not expected to provide reliable estimates of their travel patterns.” - Model Validation and Reasonableness Checking Manual

# Typical Special Generators

- Hospitals
- Airports, Bus/Rail Terminals
- Military Bases
- Casinos
- Regional Shopping Centers
- Regional Attractions
- Universities/Colleges
- High Schools
- Distribution/Warehouse/Industrial Centers
- External Trips ☺

# What Is Your Model Trying To Do?

- Reasonable Highway Assignment for LRTP
- Freight Planning for LRTP
- Detailed Highway Assignment for Facility Design
- Reasonable Multi-Modal Assignment for TDP
- Detailed Multi-Modal Assignment for FTA
- Non-Motorized Assessments

# Where Do SG Fit Into Model?

- User-Specific Data Collection
  - Household surveys
  - Site specific traffic counts
  - Site specific user surveys
  - Remote sensing
    - Cell phone (INRIX, AirSage, etc)
    - Aerial OD (SkyComp, etc)
    - BlueTooth (BlueToad, Traffax, etc)

# Where Do SG Fit Into Model?

- Trip Purpose
- SE Data
- Trip Generation
- Trip Distribution
- Time of Day
- Mode
- Assignment
- Validation

# University Surveys

- University students typically under-represented in Household surveys
- Travel diaries may cost-effectively yield valuable data
  - Generation rates
  - Distribution patterns
  - Temporal and modal specifics
  - Effects of auto ownership
- What do YOU want your Model to Do?

# Collecting University Data

- Site specific traffic counts
- Site specific user surveys
  - Ottawa RFP for:  
Post Secondary Schools; Airport/Rail/Intercity Bus Terminals;  
Major Hotels; Sporting Venues / Casino / Convention Centre
  - Texas TPP assists MPO's with special surveys for:  
Universities; Military installations;  
Hospitals; Regional malls, etc
  - Virginia, Arizona State, Utah examples
- Remote sensing
  - Cell phone (INRIX, AirSage, etc)
  - Aerial OD (SkyComp, etc)
  - BlueTooth (BlueToad, Traffax, etc)



# So, What DO You Want Your Model to Do?

- Focus on Trips To/From University?
- Interest in Trips On Campus?
- Be Sensitive to Auto Availability?
- Be Sensitive to Parking Availability/Price?
- Be Sensitive to Transit Availability/Price?
- Bicycle, Moped Policies?
- Other?
- Partner with the University

# You Have Your Data, Now What?

- Clean It!
- What is it Telling You?
  - Are Undergrad, Grad, Staff traveling differently?
  - Where is the Initial Trip to Campus coming from?
    - Do differences in Initial Trip carry through rest of day?
  - What Mode and Time?
  - Predictive Variables?
  - Is there Latent Demand due to:
    - Parking Availability/Cost
    - Limited Transit Coverage
    - Bike/Moped Policies

# Model Strategies

- Trip Purpose
  - Maintain within Existing Purposes
    - Pros:
      - No changes in model architecture
      - Add P/A's within Spec Gen file at TAZ level
    - Cons:
      - May not accurately reflect student behaviors
      - Will Impact other HBO, NHB trips

Thirteen zones containing large and unusual sites were selected as special generators and ITE trip generation rates were used to estimate trip generations. The trip purpose distribution for each special generator is shown in Table 2.6.

Table 2.6 Trip Purpose Distributions of Special Generators

Special Generator	Production				Attraction			
	Home-Based Work	Home-Based Other	Non-Home-Based	Commercial Vehicle	Home-Based Work	Home-Based Other	Non-Home-Based	Commercial Vehicle
Lutheran Hospital	0%	0%	5%	5%	55%	25%	5%	5%
Airport Terminal	0%	0%	5%	3%	24%	60%	5%	3%
Truck Stop	0%	0%	3%	40%	7%	7%	3%	40%
Merle Hay Mall	0%	0%	10%	5%	20%	50%	10%	5%
Drake University	3%	5%	5%	3%	55%	21%	5%	3%
Methodist Hospital	0%	0%	5%	5%	55%	25%	5%	5%
Southridge Mall	0%	0%	10%	5%	20%	50%	10%	5%
Truck Stop	0%	0%	3%	40%	7%	7%	3%	40%
Jordan Creek Town Center	0%	0%	10%	5%	20%	50%	10%	5%
DMACC	0%	0%	9%	4%	34%	40%	9%	4%
Adventureland	0%	0%	9%	5%	22%	50%	9%	5%
Retail Area	0%	0%	10%	5%	20%	50%	10%	5%
Valley West Mall	0%	0%	10%	5%	20%	50%	10%	5%

# Model Strategies

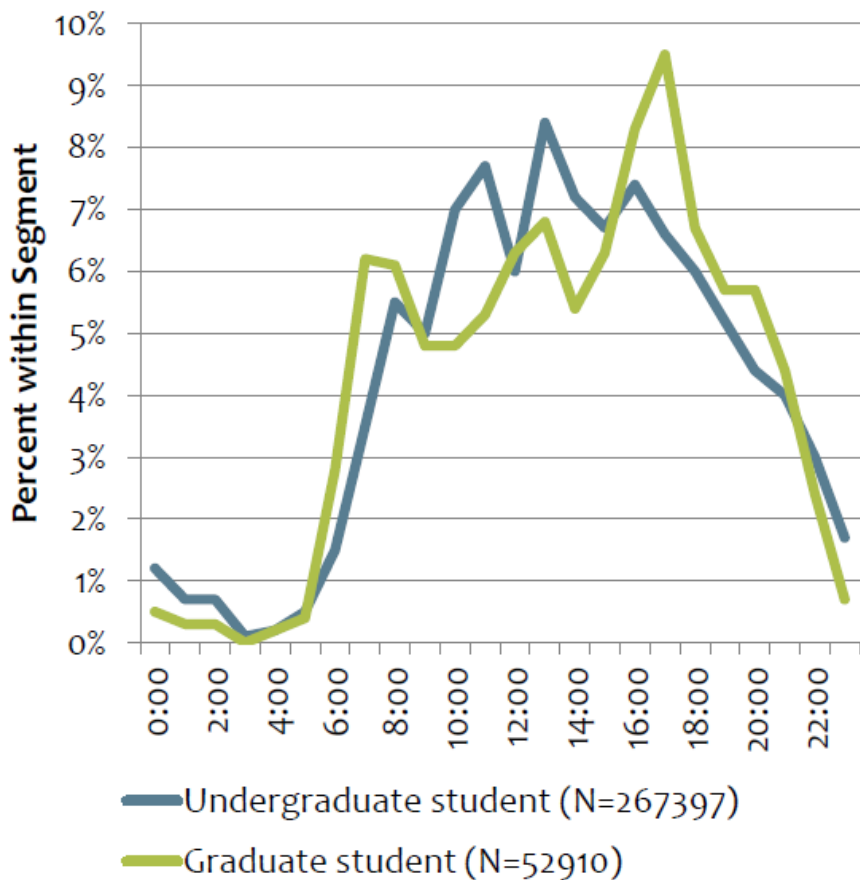
- Trip Purpose
  - Develop University Purpose(s)
    - Pros:
      - Improved Flexibility within All Steps of Model Process
      - Minimal Impact for other HBO, NHB trips
    - Cons:
      - Update Model Architecture
      - Additional SE Data
      - Estimation of Gen Rates, Dist Factors, Mode Coef, etc

# Model Strategies

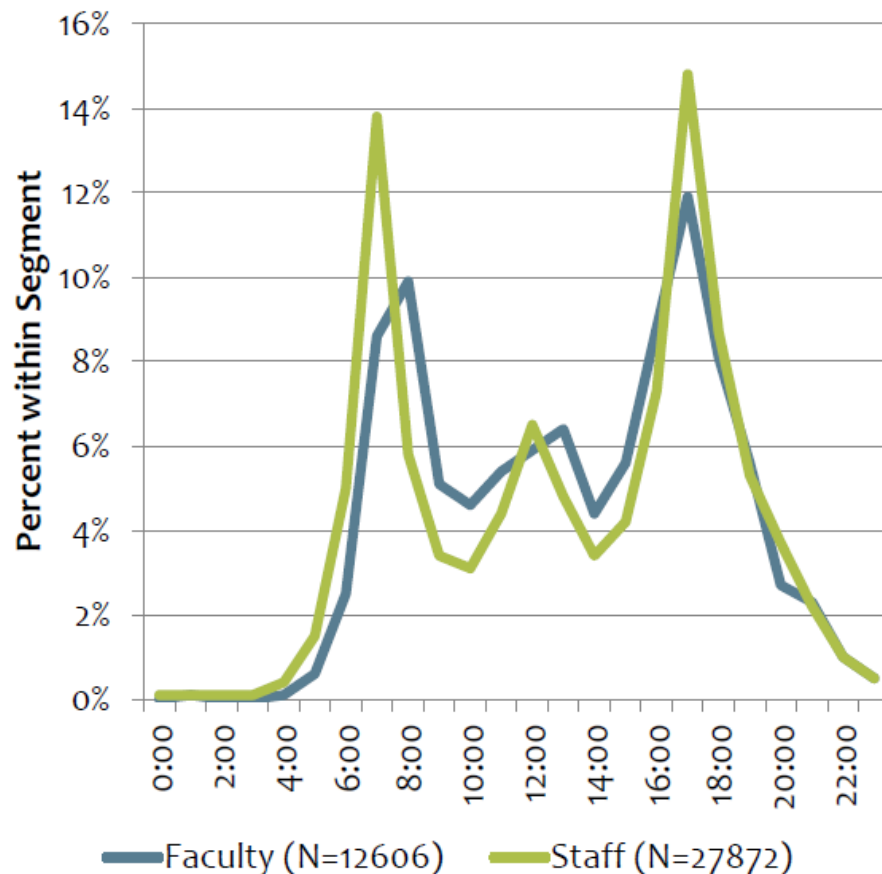
- SE Data
  - Land use specific classifications
  - Consider various categories:
    - Undergraduate
    - Graduate
    - Part-time/commuters
    - Staff/employees (including student aids)
    - Student housing
- Parking data

# Results from Other University Surveys

## Student Trips



## Employee Trips



# Model Strategies

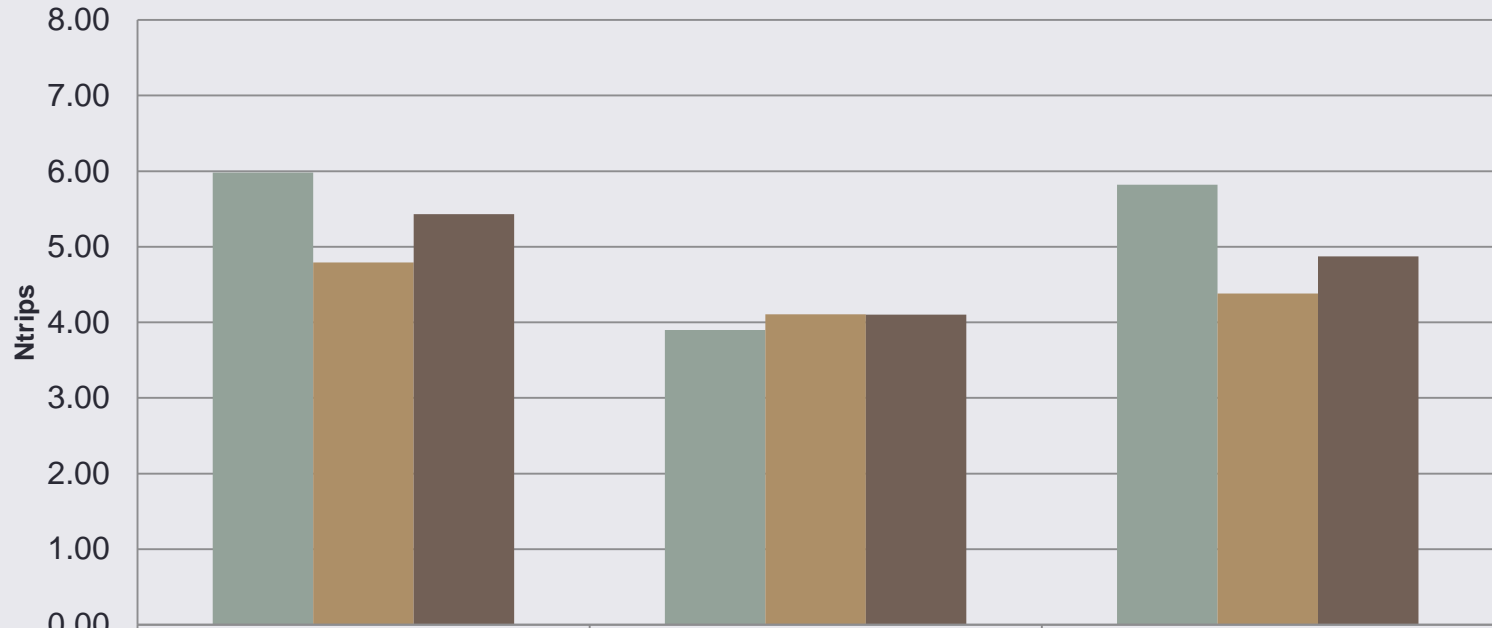
- Trip Generation
  - ITE Trip Generation Manual (vehicle trips)
  - Local Data

Table 2.9 Special Generators Trip Rates Recommended by FDOT [14]

Category	Recommended Attraction Trip Rates	Recommended Major Trip Purposes
Recreational Land Uses		
Community and Regional Park	7.7 Trips/Acre	Home-Based Social/Recreational
State Parks and Public Beaches	28 Trips/Acre	Home-Based Social/Recreational
Marinas	38 Trips/Acre	Home-Based Social/Recreational
Colleges and Universities	3 Trips/Student	Home-Based Other
Military Bases	2.7 Trips/Employee	Home-Based Other/Work
Commercial Airports	24 Trips/Employee	Home-Based Other



UVA



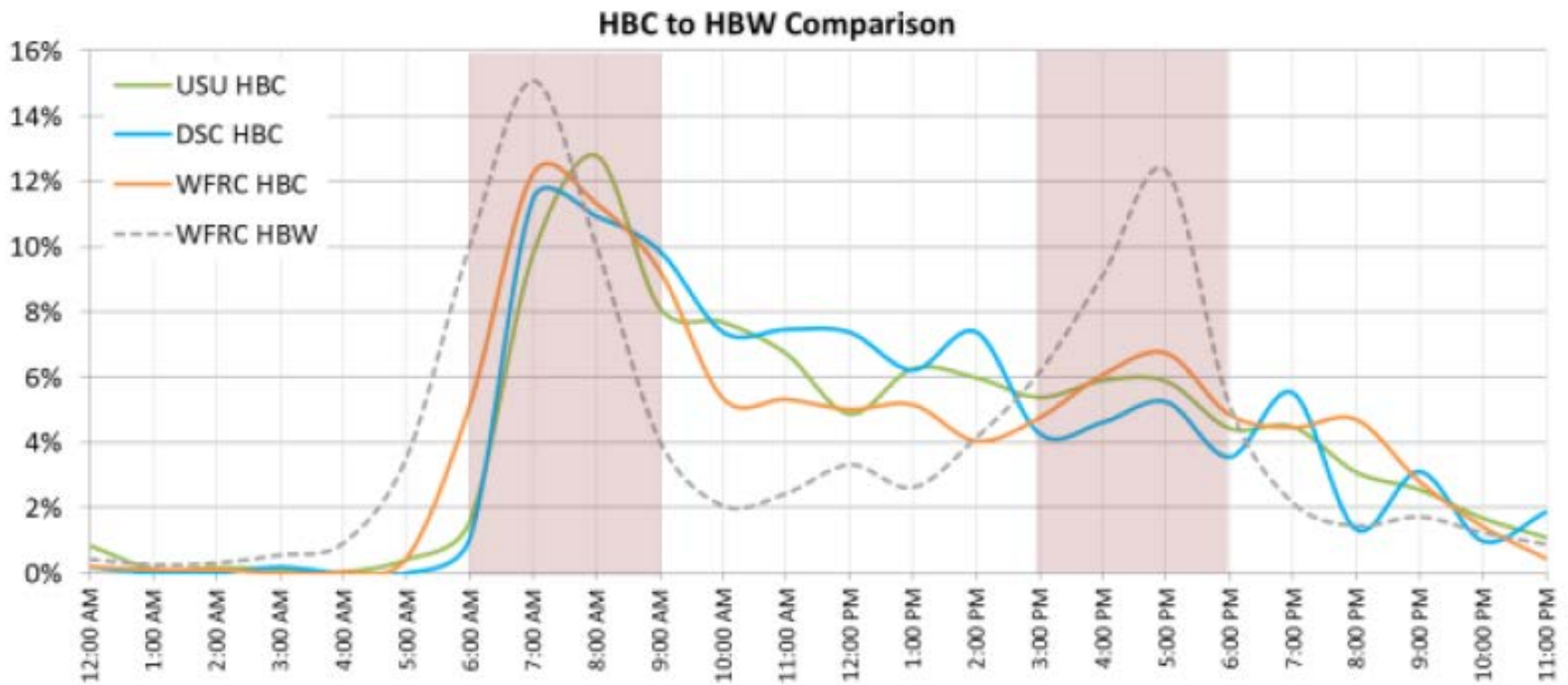
	Undergraduate	graduate	combine
■ on campus	5.98	3.90	5.82
■ off campus	4.79	4.11	4.38
■ combine	5.43	4.10	4.87

# Model Strategies

- P/A Balancing
  - Verify your expected results after balancing
  - Consider not balancing SG's
- Trip Distribution
  - Consider Trip Length Distribution (Regional?)
  - Conduct Select Zone Analysis
  - K-Factors Appropriate?

# Model Strategies

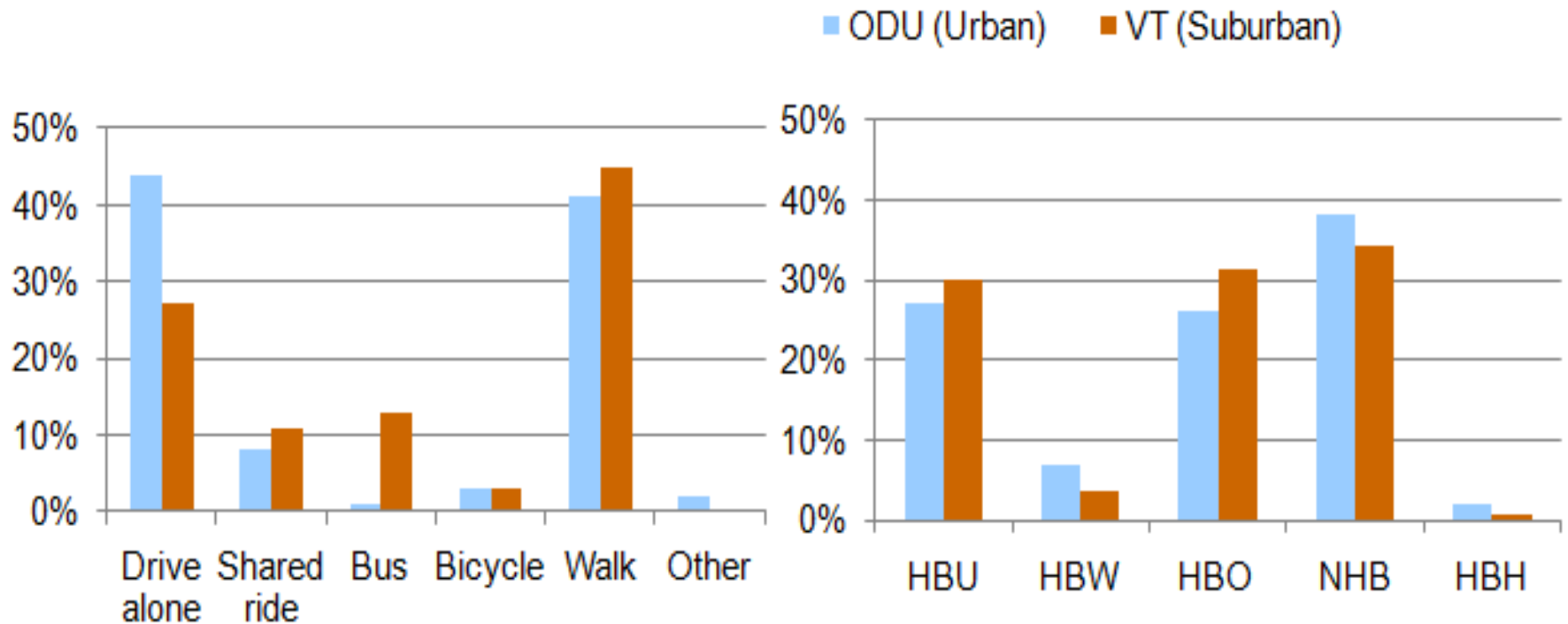
- Time of Day



Utah area colleges, 2012; Source: May 2013 TRB Planning Applications Conference

# Model Strategies

- Mode Choice



# Model Strategies

- Assignments
  - Consider where vehicle trip ends
    - Location
    - Parking availability/cost
- Validation
  - Trip Rates: ~ 3 Trips/Student: FDOT Report vs. ~4.5:Virginia DOT
  - Trip Purpose splits: Virginia DOT
  - Temporal splits: May 2013 TRB Planning Applications Conference
  - Assignment: Compare Counts at/near Special Generator: Model Validation and Reasonableness Manual

# Freight Surveys

- Need to Understand Commodity Flow Patterns
- Data Available:
  - FAF3
  - Itram
  - ATRI
- Local Activities
  
- What Do YOU Want Your Model to Do?
  - Manufacturing      - Multi-Modal
  - Distribution        - OSOW

# Collecting Freight/Commodity Data

- Site specific traffic counts
- HPMS data
- Site specific business surveys
- Photo/Video/Classification count collection
- Remote sensing
  - Cell phone (INRIX, AirSage, etc)
  - Aerial OD (SkyComp, etc)
  - BlueTooth (BlueToad, Traffax, etc)

# So, What DO You Want Your Model to Do?

- Include Truck %'s for Highway Assignment and Pavement Design?
- Improved Accuracy of Emissions Modeling?
- Evaluate Usefulness of Multi-Modal Opportunities?
- Forecast Future Freight Movements?



# You Have Your Data, Now What?

- Clean It!
- What is it Telling You?
  - Commodity Groups with Similar Patterns?
  - Observations Specific to Network Conditions?
    - Weigh Stations, Pot Holes, Tight Intersections
  - What Mode and Time?
  - Predictive Variables?
  - Is there Latent Demand due to:
    - Market Conditions
    - Chokepoint in Supply Chain

# Model Strategies

- Architecture
  - Historical Truck Percentages
    - Estimate Truck %'s by Facility or Class
    - Pros:
      - Easy to Implement
      - Provides Defendable Truck #'s for Existing Condition
    - Cons:
      - Not Sensitive to Transportation System

# Model Strategies

- Architecture
  - Estimated OD Matrix
    - Estimate Truck Movements with ODME, Truck Counts
    - Pros:
      - Assignable OD Table
      - Based on Local Truck Data
    - Cons:
      - Not Linked to SE Data
      - Heavily Reliant on Truck Count

# Model Strategies

- Architecture
  - Quick Response Freight Manual
    - Utilizes National Standards to Estimate Truck Movements
    - Pros:
      - Easily Implementable
      - Default Coefficients Available
      - Predictive Variables within SE Data
    - Cons:
      - Not supported by Local Data
      - Does not address Commodity Movements

# Model Strategies

- Architecture
  - Commodity Flow Model
    - Submodels of similar commodity types to estimate generation, distribution, temporal and mode
    - Pros:
      - Uniquely models various commodities, their reaction and impact to transportation system
    - Cons:
      - Data intensive
      - Labor intensive

# Model Strategies

- SE Data
  - Employment by category (QRFM)
  - Tonnages of commodities produced (P's) and consumed (A's)
    - Modal preferences
  - Need to determine inflow & outflow
    - Is data robust enough?
    - Forecastable? (ITRAM)

# Model Strategies

- Trip Distribution
  - Round trips or delivery tours?
  - Distance typically used for trips
  - Determine how sensitive local truck movements are to geography
    - If only 1 warehouse in town, it will have to distribute to all clients
    - HyVee will only distribute to other HyVee's, driving past Fareway stores

# Model Strategies

- Mode Split
  - Does freight transfer modes within or near model area?
  - What is driving that decision?
    - Cost
    - Travel Time
    - Transfer Time
  - Does model network need to cover these factors?



# Model Strategies

- Assignment
  - Use multi-class assignment
    - PCE's for trucks
    - Restrict or penalize trucks within assignment (OSOW)
    - Track truck purposes (select link or system-wide)

- <http://hdl.handle.net/10077/6123>