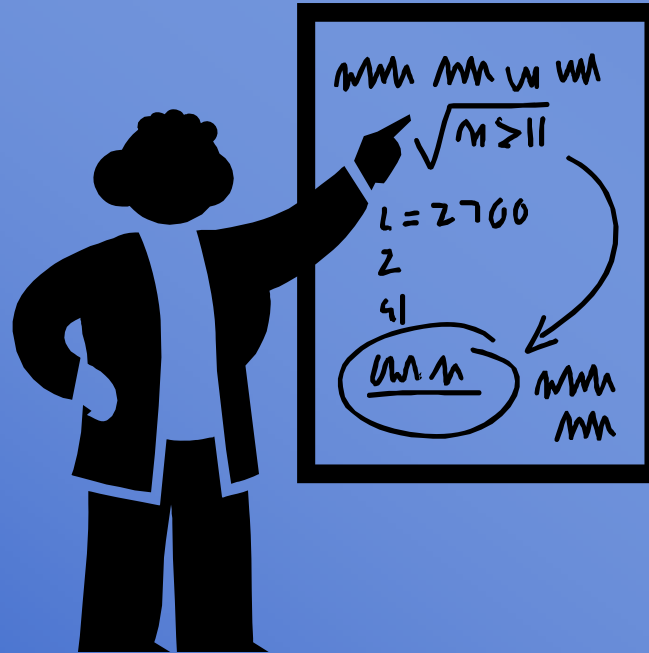
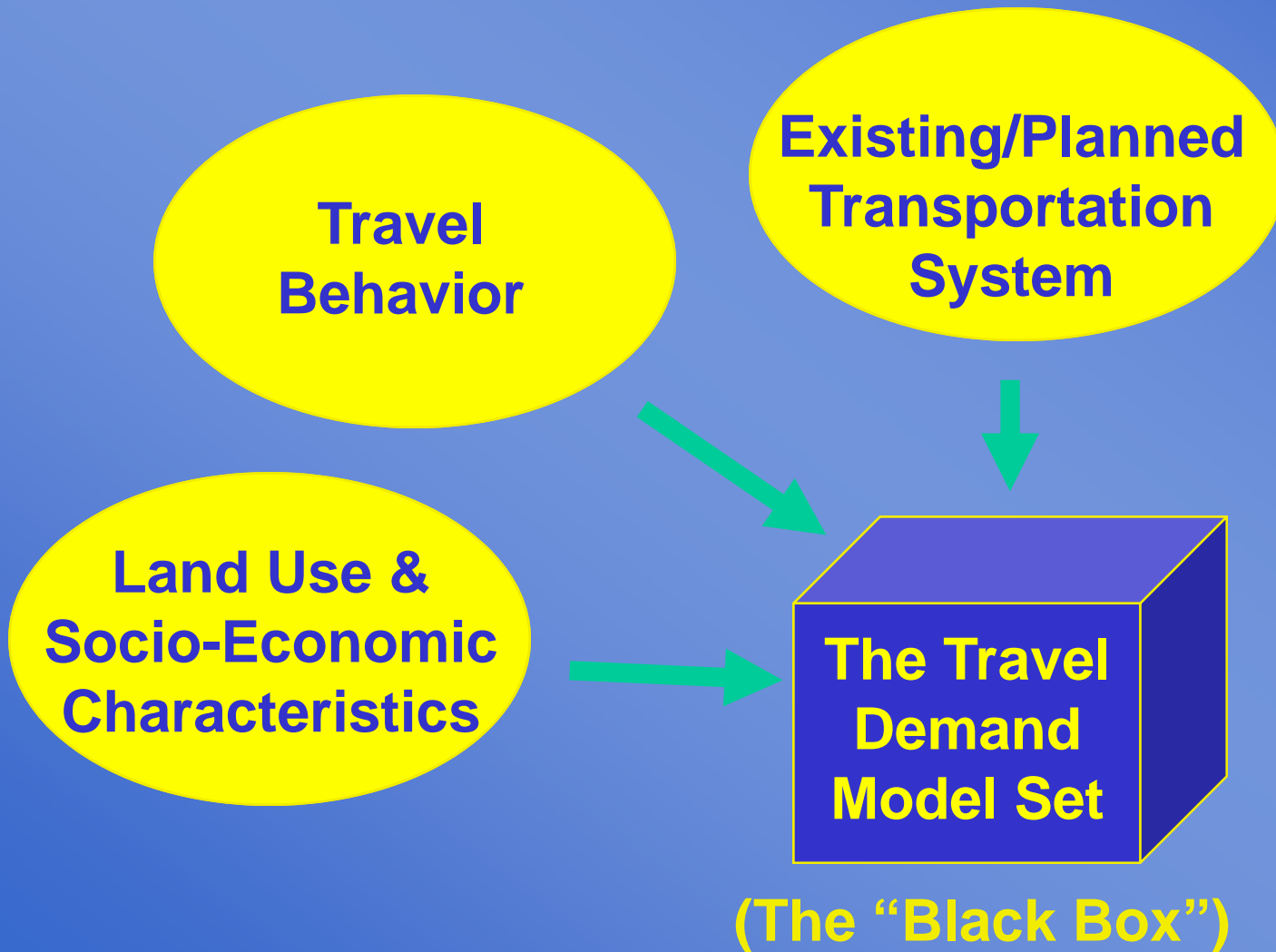


# Household Travel Survey: SMARTRAQ at the Atlanta Regional Commission

by Guy Rousseau, ARC



# Traffic Modeling at ARC - Where Do We Start?



# *SMARTRAQ's household travel* *survey purposes:*

- Update the trip generation rates used in the ARC travel demand model
- Household level data collected to supplement the 2000 CTPP JTW data
- Travel data collected by purpose, length, mode, origin-destination, and household socio-economic and demographic characteristics

## *Why ARC needs SMARTRAQ:*

- ARC's trip generation model for trip production utilized a stratified cross classification approach with strata based upon 2 main variables:
  - Household size (6 hshld sizes: 1,2,3,4,5,6+)
  - Household income (4 groups: 20, 40, 60)
- New components: vehicle ownership

## *Model Enhancements:*

- Migrate away from the traditional 4-step trip based method, and move towards an activity-based / tour-based model (long term approach) in order to better account for trip chaining.
- Trip generation was re-designed following the activity-based / tour-based modeling methodology using the SMARTRAQ household travel survey

# ARC SMARTRAQ

## Household Travel Survey Data Applications:

### Short Term **Trip**-Based Modeling

- Change the model to Census 2000 TAZ
- Revise model to increase and refine TAZs
- Update Model, based on SMARTRAQ
- Revisit trip generation

## Short Term **Tour**-Based Modeling Effort

- Grid-Based Database
- Complete Model Design
- Utilize **SMARTRAQ** household travel survey data

## Short Term **Tour**-Based Modeling Effort

- **Grid-Based Database**
  - A procedure which will allow us to “move” data from various sources of aggregations (such as TAZ).
    - GDOT Road maintenance (sidewalks)
    - ARC’s LandPro land use

# Long Term Trip-Based Modeling Effort

## Trip Generation Model

- Use the SMARTRAQ home interview
- Built a trip frequency model rather than cross classification for productions
  - Able to include system variables
  - Able to use statistical tools (Logit calibration)
- Built socio-economic strata summaries (income groups, household size, residential density)

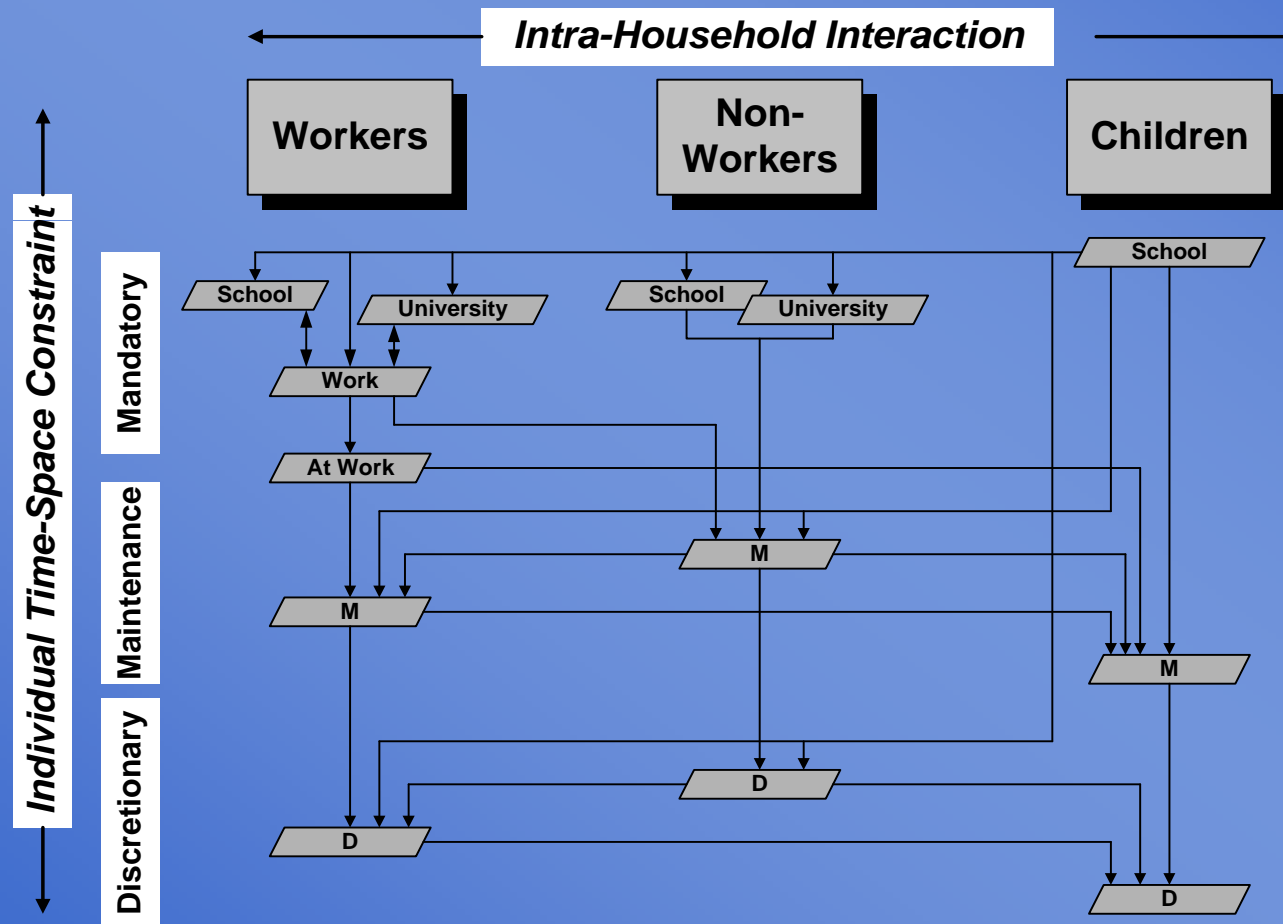
# Long Term **Trip** Based Modeling Effort

## Trip Generation Model

- Reason for new Trip Generation
  - New SMARTRAQ Home Interview
  - New thinking on trip generation
    - The next slide shows an example of households inter-relationship
    - Different purposes (maintenance, discretionary, mandatory?)

# Long Term Trip Based Modeling Effort

## Trip Generation Model



## Long Term **Trip** Based Modeling Effort

### Update Time of Day

- Use SMARTRAQ home interview to build time of day tables for input to model.
- Use latest GDOT traffic counts for validation

## Long Term Tour Based Modeling Effort

- Trip frequency model
  - Similar to model for trips except for tours.
  - Note: need to use SMARTRAQ home interview and build a set of tours

## Long Term Tour Based Modeling Effort

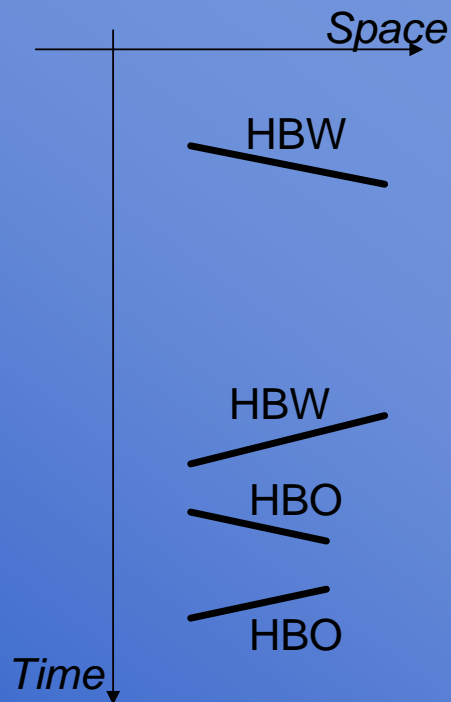
- Stop model
  - A major difference between trips and tours is the need to estimate stops (purpose and location) .

## Long Term Tour Based Modeling Effort

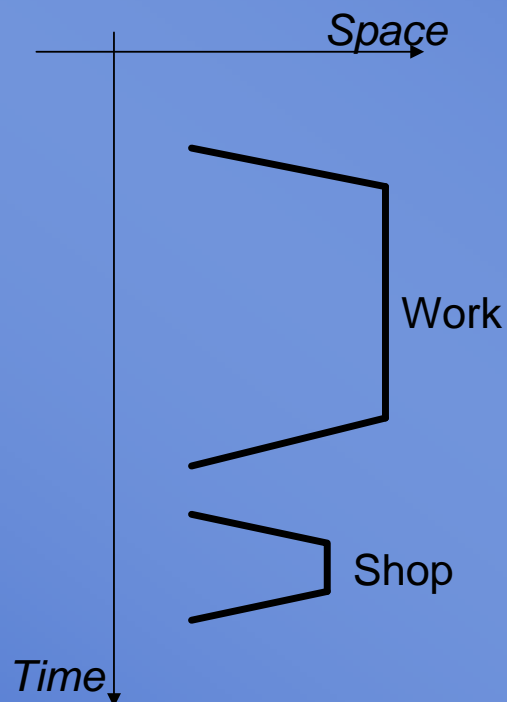
- Scheduling model
  - Some other MPO models made use of a scheduling model and we may do so here.
  - Next slide illustrates scheduling model with respect to trips and tours

# Evolution of Disaggregate Models

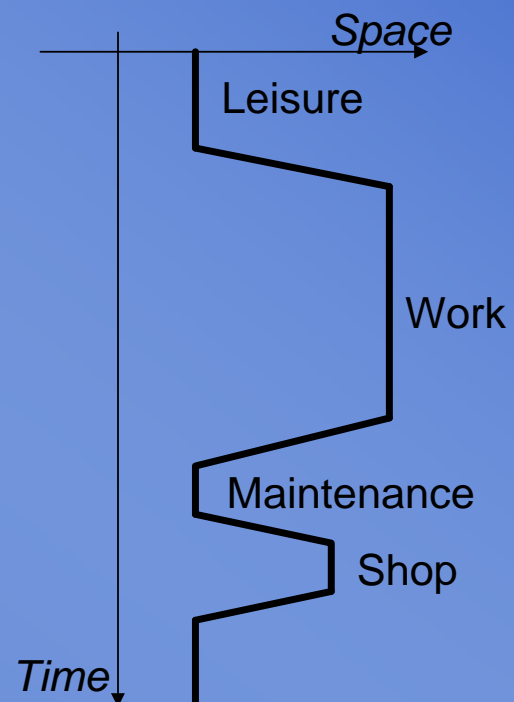
Trip-based



Tour-based



Day activity schedule



# ARC SMARTRAQ

## Household Travel Survey

### Preliminary Review of Data:

#### Geographic Distribution of Households

<b>County</b>	<b>Retrieved</b>	<b>%</b>	<b>2000 Census</b>
Cherokee	133	1.6%	3.7%
Clayton	286	3.5%	6.1%
Cobb	1,536	19.0%	16.8%
Coweta	140	1.7%	2.3%
DeKalb	2,224	27.6%	18.4%
Douglas	60	0.7%	2.4%
Fayette	84	1.0%	2.3%
Forsyth	86	1.1%	2.6%
Fulton	1,975	24.5%	23.7%
Gwinnett	1,048	13.0%	14.9%
Henry	308	3.8%	3.1%
Paulding	55	0.7%	2.1%
Rockdale	134	1.7%	1.8%
<b>Total</b>	<b>8,069</b>	<b>100.0%</b>	<b>100.0%</b>

## Address Geo-coding Outcomes

Address Type	Matched	Unmatched	% Matched	Out of Area
Home	8,069	0	100%	
Habitual (work & school)	12,403	1,819	87%	356
Other Locations	37,509	2,618	93%	1843
Total	57,337	4,437	93%	

## Household Vehicle Availability

Household Size	N	0	1	2+	Mean
One	1916	14.0%	72.7%	13.3%	1.03
Two	2503	4.1%	21.3%	74.6%	1.90
Three	1445	6.5%	19.0%	74.5%	2.06
Four+	2204	5.9%	18.5%	75.6%	2.11
Total	8,069	7.4%	32.3%	60.3%	1.78

## Household Size Distribution by Income Range

Household Size	N	< \$30K	\$30- < \$50k	\$50k - < \$75k	\$75k+	DK/RF
One	1916	37.8%	25.5%	17.8%	11.5%	7.3%
Two	2503	18.9%	17.4%	20.9%	35.9%	7.0%
Three	1445	21.1%	15.2%	19.4%	39.7%	4.7%
Four+	2204	19.6%	15.7%	19.2%	39.5%	7.9%
<b>Total</b>	<b>8,069</b>	<b>24.0%</b>	<b>18.4%</b>	<b>19.5%</b>	<b>31.8%</b>	<b>6.3%</b>

## Mode to Work

Mode to Work	N	Percent
Auto-Driver	3873	76.1%
Auto-Passenger	155	3.0%
Transit-Marta Bus	135	2.7%
Transit-CCT Bus	8	0.2%
Heavy Rail-Marta	124	2.4%
Walk/Bike	201	4.0%
Other	131	2.5%
Work From Home	75	1.5%
DK/RF	388	7.6%
<b>Total</b>	<b>5090</b>	<b>100.0%</b>

## Average Household Trip Rates by Household Income

Income	N	Day 1	Day 2
<\$30K	1935	5.65	5.32
\$30-<50K	1488	7.38	6.94
\$50-<75K	1570	8.88	8.40
\$75K+	2564	10.8	10.28
DK/RF	513	7.58	6.94
Total	8069	8.36	7.91

## Daily Trips by Vehicles per Household

Number of Vehicles	N	Day 1	Day 2
0	597	4.60	4.06
1	2607	5.80	5.60
2+	4864	10.20	9.61
Total	8069	8.36	7.91

## Daily Trips by Workers per Household

Number of Workers	N	Day 1	Day 2
None	1464	4.77	4.36
1	4334	8.75	8.22
2	2047	9.79	9.46
3+	224	11.31	10.83
Total	8069	8.36	7.91

# Conclusions

- It is possible to extend trip-based trip generation models beyond the standard income/size based cross-classification approach.
- Doing so with a set of logit models makes it possible to consider many other variables and relationships that would otherwise not be tractable.
- Although this approach still falls short of the newly emerging tour-based micro-simulation approach, it is a reasonable mid-point between them and trip-based cross-classification models.

# Continued...

- This work supports decades of prior research that have shown that household income is an extremely important determinant of household trip making.
- Income provides the resources both for consumption of goods and services and for trip making, so it should logically be a strong influence on travel.
- Total number of persons is not a key variable. For adult trip-makers, total size has largely been replaced with the “number of other adults” and the “presence of any children”.
- This suggests that the number of children in a household is not a strong determinant of travel – it doesn’t matter much whether there is one child or four. But the presence of even one child makes a huge difference over the presence of none, as every new parent will readily attest.

# More conclusions

- Number of cars, and the relationship between cars and workers, was important for many of the “discretionary” trip models. This influence is over and above that of income.
- This may suggest that the effect of “induced travel” comes indirectly from households locating in areas where transit and walking are not viable options, thus causing greater car ownership, and thus creating more trips.
- The density and accessibility variables were not very important. Researchers had theorized that high density or accessibility might relate to less trip making, since car ownership could be less and more trips could be combined. This did not prove to be the case, however. The accessibility variables were statistically too weak. In some cases, the propensity was for slightly more travel in high density areas and slightly less travel in low density areas.