Segmentation of Aggregate City Models

With linked models there is a need for consistency between the segments of travel demand used in each sub-model, and it must be feasible to estimate the population distributions for the chosen segments. In most models the key segmentation dimensions relate to: time of travel, trip purpose, person/household type and car availability.

To reduce time spent in data analysis and model calibrations, it is wise to attempt to pre-define a feasible segmentation for the model which serves the modelling objectives. This should be consistent with best international practice but recognise the limitations of the local data. Generally an efficient minimum number of segments should be sought, as extra segments may impose a disproportionate cost (to their incremental value) on model development. Usually the segmentation will be defined on the basis of preliminary data tabulations (see Task 5, Preliminary Studies).

It is helpful to ascertain what has been used in the latest modelling systems, where these have been developed by skilled teams who have had sufficient resources to base their decisions on comprehensive data analyses. Rarely do conference papers provide sufficient detail, but it is often possible to obtain calibration reports from the relevant clients/consultants.

Time periods

It should be decided whether the modelled time periods are based on time of departure, arrival or the midpoint of the trip, and whether this can vary by time period (eg am peak based on arrival time and pm peak on departure time). Various data sources can provide information to help identify the peak periods, such as household travel survey data, rail passenger surveys and road traffic counts. An example weekday classification is given below, related to trip midpoint time.

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am peak: 7.00-8.59am
interpeak: 9.00am-3.59pm
pm peak: 4pm-5.59pm
offpeak: 6pm-6.59am
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Trip Purpose

Household travel survey tabulations should be used to identify (i) the proportion of trips for each purpose, there being no point in small segments because model calibrations will not be statistically reliable, and (ii) segments with markedly different travel behaviour (eg mode shares, trip lengths, time of travel, growth rates). A typical trip purpose grouping is given below.

Personal travel:
□ HB work
□ HB education
□ HB shop
□ HB social/other
□ NHB other
HB/NHB Business travel
Travel by commercial vehicle

Note: HB: home based; NHB non home based

Car Availability

The general principle of splitting the market into segments which have very different constraints on their choice of transport mode is widely applied; some segmentation examples are given below. A choice between the different measures may be made from analysis of household travel data but is constrained by the need to forecast the segments; for example, it may not be intended to include a means of forecasting possession of driving licences.

Segment	Segment Description	Alternative Measures
Captive	Persons without access to a car	Persons in a non car owning household Persons without a driving licence
Competition	Persons with access to a car, but in a household where other drivers share the use of the car	Persons in one car households Persons in households with more adults than cars Persons in households with more licensed drivers than cars
Choice	Persons with sole use of a car	Persons in multi-car households Persons in households with as many cars as adults Persons in households with as many cars as licensed drivers

Note: definition of adult should be specified, related to driving age.

Household and Person Segmentations

These are required for the car ownership and trip end sub-models, and may influence (in some more aggregated form) the distribution and mode choice models. While early models adopted a rather limited household segmentation, the tendency now is to focus more on personal characteristics, and one example of such a segmentation is given below.

Illustrative Trip Production Model Segmentation
Person types: □ infant (<5) □ child (5-16) □ young adult (17-25) unemployed □ young adult (17-25) employed □ adult (26-60) unemployed □ adult (26-60) employed □ "retired" (>60) Household types: □ car ownership: 0, 1, 2+

In some models the employed are further classified by the nature of their employment, for example, blue/white collar, full time/part time/casual and? other (self-employed etc). A typical segmentation for the car ownership model is illustrated below.

Illustrative Car Ownership Model Segmentation
No. of adults: 1, 2, 3+ Household Status: retired, non-retired

This segmentation may be further refined to allow for the presence of employed persons, and the existence of children in the household has also been included in other models, though this seems a demanding refinement.

How the trip end and car ownership model segmentations interact is summarised below.

In the 1st column is the household segmentation used in the car ownership model. For the households of each type in each transport zone, the car ownership model apportions them between car ownership groups (the 2nd column). In this example, the combination of number of adults and number of cars enables car availability to be specified (the final column).

The middle 7 columns refer to the 7 trip production model person types. In the Wellington model, the proportions of people of each type for each zone are obtained from the planning forecasts. In order to apply the trip production model to forecast the number of trips for each car availability segment in a zone, we need to know the number of persons of each type within each car ownership model household type. For this we need a model of family structure, which takes the individual distributions by person type and household type for a zone and forecasts the cross-classification.

Car Ownership Model Household Segmentation	Car Ownership Forecasts	Trip Production Model Person Type Segmentation							Car Availability Classification
Retired 1 adult	0								Captive
	1								Choice
Non-retired 1 adult	0								Captive
	1								Choice
Retired 2 adults	0								Captive
	1								Competition
	2+								Choice
Non-retired 2 Adults	0								Captive
	1								Competition
	2+								Choice
3+ Adults	0								Captive
	1								Competition
	2+								Choice*

* an approximation

Acknowledgment