

Modelling time of day choices, income segmentation

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Overview

- Both these topics are important elements in current TIF Guidance
- However, the associated technical difficulties have not been widely discussed, and experience is limited
- In the time available, only a brief account can be given

Time of day modelling (ToD)

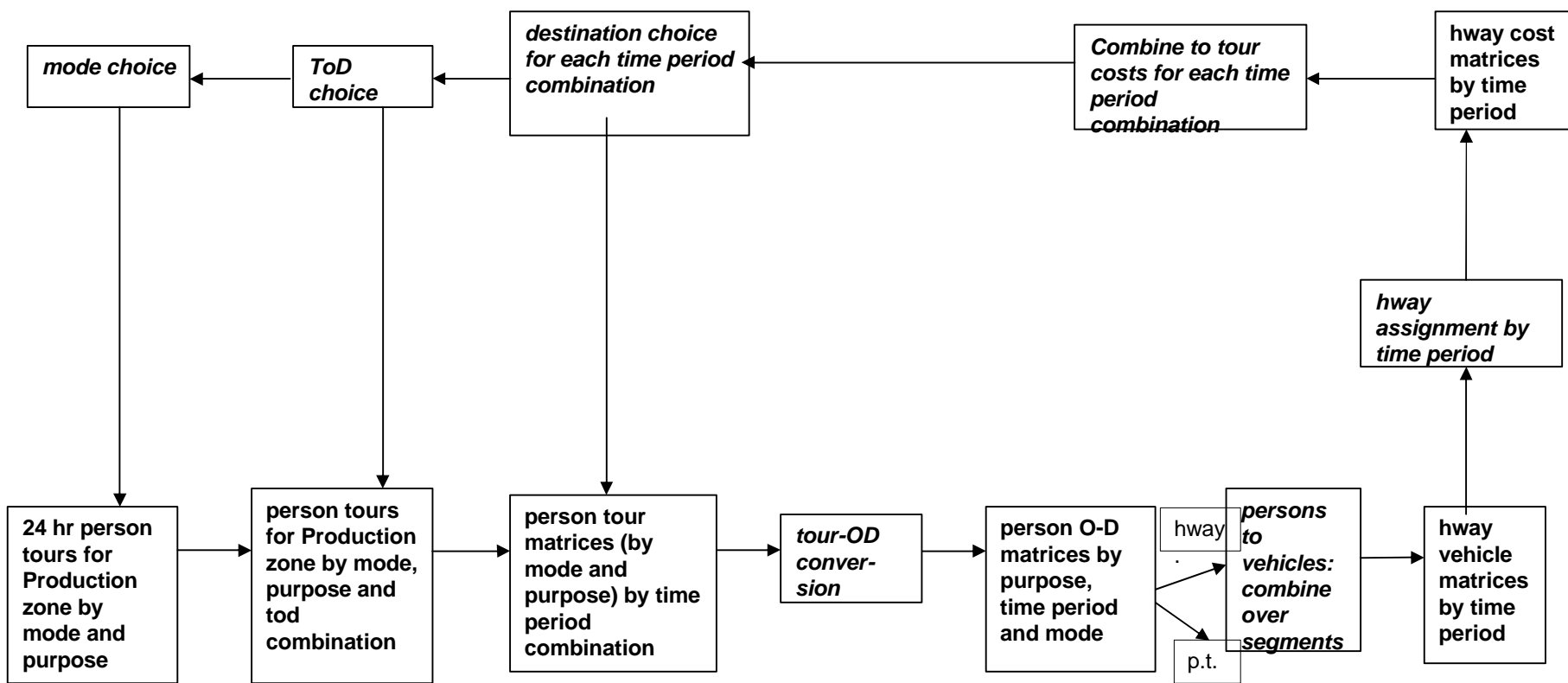
- We confine discussion to **macro** time shifts, although “micro” shifts should also be tackled, in conjunction with Dynamic assignment
- Primary motivation is modelling response to time-varying RUC
- Practical experience is more or less limited to two modelling “schools”:
 - PRISM (RAND) < Dutch National Model
 - GMSPM (MVA) < TRAM < APRIL (WSP)

ToD – current Guidance [TAG 3.12.2 and 3.10.3]

- 3.12.2
- “core requirement is for the morning and evening peak and the interpeak periods to be modelled. If a time of day model is implemented, this will allow transfers between these broad time periods to be modelled” [3.7.3]
- “macro time period choice ...should be considered when strong cost differentials between time periods are expected to develop or change. This is obviously the case where different road prices are proposed for the peak and inter peak or off-peak periods” [5.1.4]
- 3.10.3
- “There is limited evidence on the strength of the macro time choice mechanism. Recent Departmental research [*ref*] suggests that time period choice is generally more sensitive to changes in travel conditions than mode choice. ...
- “Where circumstances justify the use of this technique, it can be important to apply different sensitivity parameters to different trip purposes. [1.8.4-5]

ToD: problems

- It was only appreciated **after** the Guidance was issued that ToD modelling virtually requires a tour-basis [Gordon et al, 2007]
- There is an associated need for local data on “return home proportions”
- serious questions about time period **definition**, especially to deal with “shoulders”
- ideally require > 3 periods, but consequences for assignment
- Hierarchy is implicitly Mode $>$ Time $>$ Destination



ToD Concluding thoughts

- Need to review the effort/success of the few existing attempts vs 24-hour demand modelling plus fixed factors
- Much more guidance and discussion needed!

Introducing income segmentation

- It is a “core requirement” for TIF to have income segmentation (essentially, VoT)
- For incremental demand models, this implies that base matrices must be segmented by income
- Because of the interrelationship with car availability, mode, person type and purpose, this is complex
- In addition, the income data available at the local level is very variable

Income Segmentation

- crucial to distinguish **route choice** from general demand segment issues
- for cordon schemes route choice is a minor issue but for tolled schemes it is critical
- implies careful thought as to network [user class] **and/or** demand segmentation

Current Guidance [3.12.2]

- This concentrates almost entirely on network [user class] segmentation, suggesting that O-D matrices can be straightforwardly factored
- In fact, it is much more complicated (zonal household distribution is a long way from what is needed...).
- Proposals have been made to use NTS data, CACI data, NATCOP-based relationships, but no updated Guidance
- practical experience – limited to: GMSPM + some LU models using **SEG**

Income segmentation

- on demand side, **implementation** is straightforward (more segments!), if data problems are solved
- on supply side, more user classes leads to longer runtimes and other problems:
 - Stability: eg multiple UCs with **same** VoTs gives different results from unsegmented
 - lack of validation data for route choice propensity by income

Conclusion

- Much to be done on both topics
- Little point in issuing Guidance with “core requirements” if they cannot be satisfied!
- Existing experience should be gathered and reviewed and on that basis:
- Detailed guidance should be issued, stating principles, data requirements, and appropriate methodologies