Gen2 Travel Demand Forecasting Model Update and Software Evaluation

Ali Etezady, Project Manager | RSG, Inc.
COG/TPB Travel Forecasting Subcommittee

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Purpose of the two efforts

Update the model and assess the tools supporting regional modeling

Gen2 model update

Refresh demographic and travel relationships

Calibrate to 2018; validate for 2018 and 2025

Deliver updated code, parameters, and documentation

Software evaluation

Examine assignment and skimming

Review network editing, managing scenarios, and maintaining scripts through software upgrades

Assess ownership cost and conversion requirements

Gen2 work proceeds within the existing software environment.

Objectives of the Gen2 update

Within the existing Gen2 framework

1
Support continued use of Gen2

For air-quality conformity analyses, long-range planning, and project-level studies.

2
Refresh the representation of regional travel

Update demographic and travel relationships using the 2017/2018 Regional Travel Survey and supporting observed data.

3
Recalibrate and validate

Recalibrate to **2018** conditions, then validate against 2018 and **2025** post-pandemic conditions.

2007
Current calibration base year
Existing Gen2 model

→

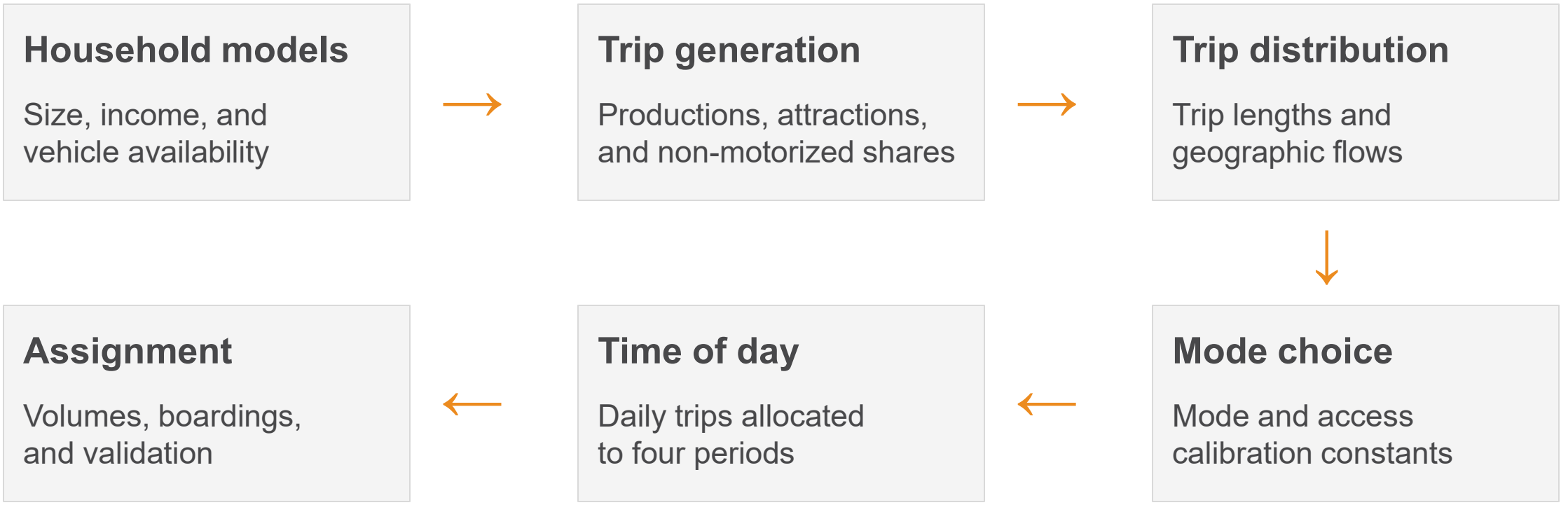
2018
Recalibration base year
Validated to 2018 survey data

→

2025
Validation year
Post-pandemic WFH rates, traffic counts, and transit boardings

Gen2 model structure and update components

Updates carry through the model chain



Assignment comparisons inform further calibration of upstream components.

Data sources and their roles in the Gen2 update

ACS American Community Survey	Household size and income distributions; updated zonal income index; Work-from-home rates
2017/2018 RTS Regional Travel Survey	Vehicle availability, trip rates, non-motorized shares, trip-length patterns, and time-of-day factors
CTPP Census Transportation Planning Products	Income distribution of home-based work attractions
Calibrated Gen3 results Household and transit survey evidence	2018 mode-choice calibration targets by purpose, mode, income, and district
Counts and ridership Observed highway and transit use	Assignment validation using traffic counts, VMT, screenlines, and transit boardings

A reproducible workflow COG can rerun

Code-based analysis with a clear path to client ownership

Documented inputs

Survey, land use, networks, and settings

→

Code and notebooks

Processing, estimation, calibration, and checks

→

Reusable outputs

Parameters, diagnostics, and documentation

Repeatable

Rerun from documented inputs
and configuration settings

Portable

Keep analysis code separate from platform-specific adapters

Transferable

Deliver code and instructions
that COG staff can repeat

Approach: automate data transformations and calculations; retain explicit model-review decisions.

Vehicle availability: explanatory variables

Re-estimate with the same five variables, using the 2017/2018 RTS

Estimates 0-, 1-, 2-, and 3+-vehicle alternatives. The utility specification is not expected to change.

Household

Household size
Larger households generally favor 2 or 3+ vehicles

Household income
Higher groups favor vehicle-owning alternatives

Built environment

Area type
Less dense areas generally favor more vehicles

DC indicator
Negative for vehicle-owning alternatives

Accessibility

Transit job accessibility
Higher accessibility reduces the probabilities of owning more vehicles

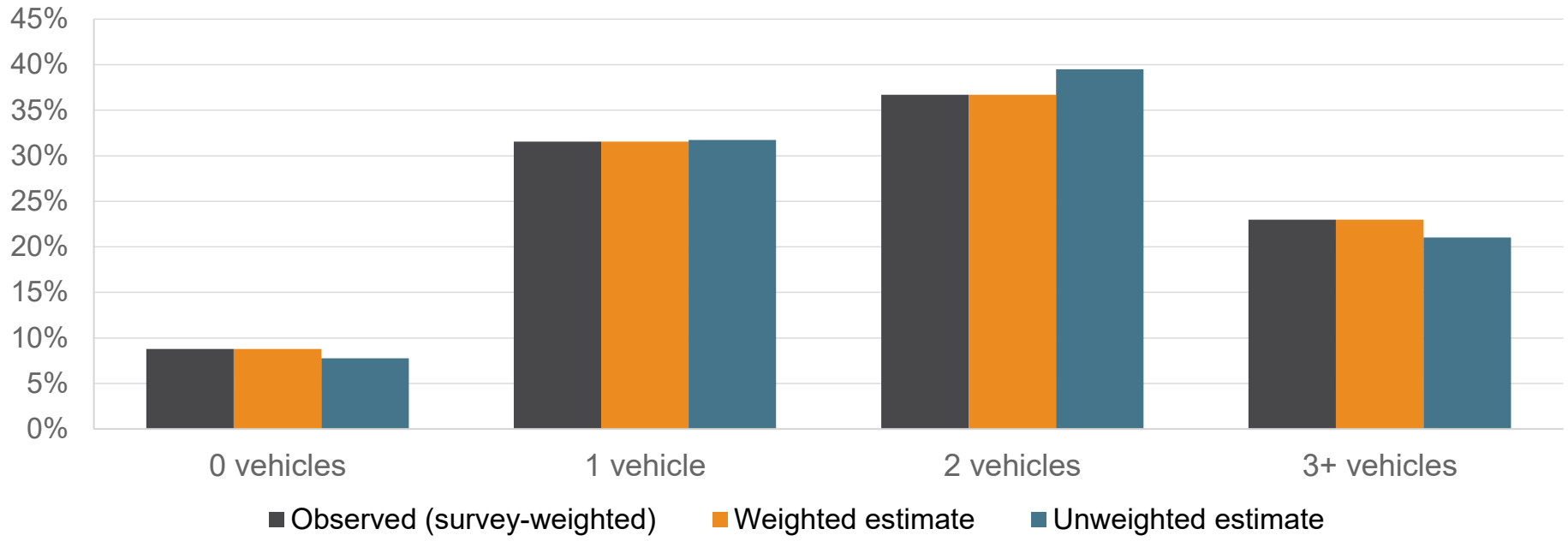
Regenerated from refreshed 2018 transit skims, consistent with the calibration year.

Categorical variables are coded as dummy variables; numeric category codes do not imply equal utility steps.

Vehicle availability: survey and estimated shares

Compare survey-weighted household shares across estimation approaches

Same explanatory variables and categorical specification; weighting differs.



In-sample comparison; regional share agreement is not independent validation.

(16,944 households)

Gen2 update: progress and next steps

Technical work completed

- **Household submodels:** household size, income, and vehicle availability
- **Trip generation:** productions, attractions, non-motorized shares, and attraction income allocation

Work underway

- Technical documentation and review of upstream components
- Preparing trip distribution and mode choice calibration workflows for use once upstream components are finalized

Next steps

- Finalize and implement upstream components
- Generate consistent 2018 trip ends and skims
- Begin trip distribution calibration, followed by mode choice calibration

Preparing downstream calibration in parallel with upstream finalization

Connecting 2018 calibration with 2025 validation

1 Establish the 2018 model

- Calibrate components using 2018 evidence
- Validate assignments against 2018 traffic counts and transit boardings

2 Represent changes in travel

- Apply 2025 networks, land use, and costs
- Use Gen3 to estimate trip-rate adjustments associated with changed work-from-home patterns
- Apply those adjustments to Gen2's 2025 trip-generation outputs

3 Validate and refine for 2025

- Compare traffic volumes, VMT, screenlines, and transit boardings
- Investigate discrepancies and adjust relevant components
- Rerun and document the resulting performance

Gen3 telework comparison: run Gen3 under pre- and post-pandemic telework conditions with other inputs held constant, then derive trip-rate adjustment factors by purpose, income, and area type.

Approach as proposed in the final Task 4 scope, which includes one recalibration and revalidation iteration.

Software evaluation

Part 2 of 2

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Software evaluation objectives and coverage

1 Administrative: show periodic review

Part of the work which periodically assesses whether COG's current Cube software offers needed functionality at a reasonable cost to justify the ongoing license fees.

2 Technical: best fit for modeling needs

Help COG ensure it is using the travel demand forecasting software that best meets its technical modeling needs.

Coverage: commercial platforms

Bentley OpenPaths · Caliper TransCAD · PTV Visum

Cube serves as the existing reference implementation where appropriate.

Preparing the vendor implementations

1

Engage the three vendors

Bentley, Caliper, and PTV agreed to develop highway and walk-transit skimming and assignment demonstrations using COG inputs for evaluation.

2

Document COG's procedures

RSG documented COG's existing highway and transit skimming and assignment procedures.

3

Prepare a common test package

RSG provided each vendor documentation, networks, trip tables, scripts, and reference outputs.

4

Evaluate vendor implementations

RSG reviews how each vendor implemented COG's procedures and uses the common test package for controlled testing and output comparisons.

Preparation to date

Evaluation ahead

A common specification and test package establish the basis for comparing implementations and explaining differences.

Vendor presentations and workflow demonstrations — to be scheduled

Software Evaluation

Combine measured outputs with observed workflows and experience

Evaluation activity	Question it addresses
Implementation review	How does each package compare in terms of results?
Controlled tests	Comparing performance and replicability across different settings
Workflow demonstrations	How do staff edit, automate, and diagnose results?
Peer-agency discussions	What are some of the user experiences with each software package?
Ownership / conversion	What would adoption and ongoing maintenance involve?

Keep tested results, demonstrations, reported experience, and vendor statements distinct.

Comparing performance and explaining differences

1	**Establish a comparable basis**	Common COG inputs; documented implementation methods, settings, and computing environment.
2	**Measure performance and consistency**	Assignment and skimming runtimes and consistency across repeated runs, convergence criteria, and processor settings.
3	**Compare outputs**	Travel time and cost skims, assigned volumes, and path availability.
4	**Explain important differences**	Trace selected origin–destination paths or transit strategies where results vary across implementations for comparison purposes .

Interpret runtime together with convergence, output consistency, and the reasons for important differences.

Evaluation approach for the specified AM-peak highway and walk-transit procedures.

Peer Agency Outreach

Six peer-agency interviews conducted in October 2026

Software use and workflows

- What do you use the software for?
- What works well, and what is difficult?

Networks and integration

- How do you maintain networks and scenarios?
- How do you automate procedures and connect with other tools?

Staffing and support

- What expertise is needed?
- How useful are documentation, training, and vendor assistance?

Costs and transitions

- Software maintenance\annual license fees?
- Costs of upgrades, conversion, and regional user access (if applicable)?

Next steps..

Carry the work through implementation, validation, and documentation

Gen2 update

Finalize and implement components; calibrate the integrated model; validate assignments and document year-specific adjustments.

Software evaluation

Complete comparable tests and workflow reviews; document peer agency outreach; vendor presentations

Users will need clear documentation of changes, application requirements, and remaining limitations.

Questions and feedback

Which modeling workflows or application needs
should receive particular attention as this work proceeds?

Ali Etezady | RSG, Inc.