

Turas

Transparent. Trustworthy. Tangible insights.

Technical Specification & Statistical Documentation



Platform: R 4.0+ with renv for full reproducibility | **Modules:** 11 production-ready | **Reliability:** TRS v1.0

Every calculation uses peer-reviewed, open-source R packages. No proprietary black boxes. All methods auditable.

Design Philosophy

Transparency: All methods use published R packages with peer-reviewed implementations.

Defensibility: Industry-standard methods with documented assumptions and limitations.

Reproducibility: renv package management locks exact versions. Your analysis will reproduce identically in five years.












Data Security: Your data runs on our machines—never uploaded to AI platforms for processing.

Turas Reliability Framework (TRS)

Every Turas analysis produces a definitive outcome. No silent failures. No ambiguous results.

Component	Purpose
Guard Layer	Pre-flight validation before any analysis runs
Structured Refusals	Clear error messages with actionable fix guidance
Run State Tracking	Four definitive outcomes: PASS, PARTIAL, REFUSE, ERROR
Atomic File Writes	Prevents corrupt or partial output files

Module Overview

Module	Primary Packages	Why This Package
 Weighting	survey	Gold standard—powers US Census, CDC, WHO
 Tabs	Base R stats	R Foundation maintained, universally validated
 Confidence	Base R, future	Core stats + parallel processing for bootstrap
 KeyDriver	xgboost, shapviz	Industry ML standard + Lundberg's TreeSHAP
 CatDriver	MASS, nnet	R Core Team maintained, canonical implementations
 Tracker	Base R, future	Standard parametric inference, parallelised
 Conjoint	mlogit	Nobel-cited methodology (McFadden 1974)
 MaxDiff	survival, cmdstanr	Mayo Clinic clogit + Gelman's Stan team
 Segment	cluster, poLCA	R recommended packages, proven algorithms
 Pricing	pricesensitivitymeter	Purpose-built for Van Westendorp/Gabor-Granger
 AlchemerParser	Base R	Workflow automation, no external dependencies

Module Specifications

Weighting

Corrects sample imbalances so your data reflects the population you're studying.

Package: *survey* (Thomas Lumley) — The definitive R implementation for complex survey analysis, used by US Census Bureau, CDC, and WHO.

Methods: Design weights (cell weighting), rim weights via `calibrate()` with raking/linear/logit calibration, weight trimming, efficiency diagnostics (`n_eff/n` ratio).

Foundation: Deming & Stephan (1940), Kish (1965).

Tabs

Cross-tabulations with significance testing—the foundation of survey reporting.

Package: *Base R stats* — R Foundation maintained, the most validated statistical functions available.

Methods: Weighted z-tests for proportions, weighted t-tests for means, chi-square tests, Fisher's exact (small cells), effective sample size (Kish 1965), multiple comparison correction (Bonferroni, Holm).

Output: Cross-tabulation matrices, significance markers with p-values, Wilson score CIs, sample sizes (weighted/unweighted).

Confidence

Quantifies how reliable your estimates are—margin of error, credibility intervals, sample quality.

Packages: *Base R*, *future* — Core statistical functions plus parallel processing for computationally intensive bootstrap methods.

Proportions: Normal approximation (MOE), Wilson score, bootstrap percentile (BCa), Bayesian credible intervals.

Means & NPS: t-distribution CI, bootstrap percentile, Bayesian credible intervals.

Sample quality: Kish effective sample size, DEFF, CI adjustment for design effects, weighted bootstrap.

Foundations: Brown, Cai & DasGupta (2001), Kish (1965), Efron & Tibshirani (1993).

KeyDriver

Identifies which factors most influence your outcome metric (NPS, satisfaction, likelihood to recommend).

Packages: *xgboost*, *shapviz* — Industry-leading gradient boosting (used by Kaggle winners) plus Lundberg's TreeSHAP implementation.

Methods: Partial R^2 decomposition (Lindeman, Merenda & Gold 1980), SHAP values for individual-level attribution, importance-performance analysis.

Advantages: Handles multicollinearity, captures non-linear effects, provides individual-level explanations..

CatDriver

Key driver analysis for categorical outcomes—what influences tier choice, segment membership, or yes/no decisions.

Packages: *MASS*, *nnet*, *brglm2*.

Methods: Binary logistic (glm), ordinal logistic (polr), multinomial logistic (multinom), bias-reduced estimation for sparse data.

Key feature: Canonical design-matrix mapper ensures correct coefficient-to-level mapping—no string parsing hacks.

Diagnostics: Brant test (proportional odds), AIC/BIC, McFadden's R^2 , ROC/AUC. Foundations: Agresti (2002), McCullagh (1980).

Tracker

Tracks survey metrics across waves— have perceptions or satisfaction metrics actually shifted across waves?

Packages: *Base R stats*, *future* — Standard parametric inference with parallel processing for multi-wave datasets.

Methods: Wave-to-wave z-tests and t-tests, trend significance testing, banner trend analysis, question mapping across waves with code changes.

Quality checks: Base size stability, demographic composition drift (chi-square), question continuity validation.

⚡ Conjoint

Understands preference trade-offs—if you reduce price but remove free shipping, do customers still prefer your offer?

Package: *mlogit* (Yves Croissant) — Implements McFadden's (1974) random utility model, the methodology that won the 2000 Nobel Prize in Economics.

Methods: Multinomial logit (MNL), conditional logit fallback (`survival::clogit`).

Requirements: $n \geq 200$ for aggregate, 10-15 choice tasks per respondent.

Output: Part-worth utilities (zero-centered), attribute importance, Excel market simulator with sensitivity analysis.

↕ MaxDiff

Reveals true preference rankings—which features, messages, or attributes matter most to your customers.

Packages: *survival*, *cmdstanr* — Mayo Clinic's clogit (30+ years clinical validation) plus Andrew Gelman's Stan team for HB estimation.

Methods: Conditional logit for aggregate, Hierarchical Bayes via Stan (HMC sampling) for individual-level utilities.

Design: Balanced incomplete block designs via AlgDesign with D-optimal efficiency.

Convergence: Full diagnostics (Rhat, ESS, divergences). Requirements: $n \geq 150$ aggregate, $n \geq 200$ for HB.

Foundations: Louviere & Woodworth (1983), Carpenter et al. (2017).

🧩 Segment

Discovers natural groups in your customer base—distinct segments that need different approaches.

Packages: *cluster*, *poLCA*, *MASS* — R's recommended packages for clustering and classification, proven algorithms with decades of validation.

Methods: K-means (Hartigan-Wong), Latent Class Analysis for categorical data.

Optimal K: Elbow method, silhouette score, Calinski-Harabasz index, BIC for model-based selection.

Validation: LDA discrimination, ANOVA/chi-square profiling, Mahalanobis outlier detection. Requirements: min 100 per cluster.

💰 Pricing

Determines optimal price points and acceptable ranges—what will customers pay?

Package: *pricesensitivitymeter* — Purpose-built for pricing research, implements established methodologies correctly.

Van Westendorp PSM: Four-question price perception analysis—OPP, IDP, PMC, PME with Newton-Miller-Smith extension for purchase probability.

Gabor-Granger: Sequential purchase intent, demand curves, price elasticity, revenue optimization.

Foundations: Van Westendorp (1976), Gabor & Granger (1966), Newton, Miller & Smith (1993).

Scope & Limitations

Turas is designed for applied market research - solid, defensible analysis.

Not implemented: General Bayesian methods (except HB for MaxDiff), causal inference frameworks (IV, RDD), machine learning beyond XGBoost for SHAP, multiple imputation for missing data (listwise deletion is default), real-time/streaming analysis, interactive dashboards.

Assumption handling: Assumptions are tested and documented. Normality violations trigger robust alternatives (bootstrap). Outliers flagged with diagnostic plots. Minimum sample sizes enforced—underpowered analyses refused, not run with warnings.

What You Receive

Every Turas project includes documentation that lets you defend your methodology:

- ✓ **Excel reports** with multiple worksheets, formatted output, significance markers (if requested)
- ✓ **Methodology documentation** — methods used, assumptions tested, limitations acknowledged
- ✓ **R package versions** — exact versions used, enabling reproduction years later
- ✓ **Interpretation guidance** — what the numbers mean in plain language
- ✓ **Technical appendix available** — detailed specifications

Package Provenance

All packages are CRAN-published with established track records. Combined downloads exceed **400 million**. Key maintainers include:

Thomas Lumley (survey) — University of Auckland • **Andrew Gelman** (Stan/cmdstanr) — Columbia University
• **Terry Therneau** (survival) — Mayo Clinic

Yves Croissant (mlogit) — Econometrician • **Venables & Ripley** (MASS) — R Core Team • **Scott Lundberg** (SHAP methodology)

The Bottom Line

Turas uses established methods correctly. For applied market research, it provides solid, defensible analysis with full documentation. **No black boxes. No proprietary algorithms.**

About The Research LampPost

Turas is developed and delivered by **The Research LampPost**, an organisational member of the Southern African Marketing Research Association (SAMRA). Duncan Brett is a SAMRA accredited researcher with 30+ years of market research experience. If you have questions about whether Turas is right for your project, if there is interest module-specific information, or you would like a copy of our credentials, please get in touch at duncan@researchlamppost.co.za.

Technical inquiries & collaboration

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