CONCEPT

Structural Equation Modeling (SEM): CFA, Path Models and PLS-SEM with AMOS, SmartPLS and lavaan

12 – 16 July 2027
London - Central London four-star



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Ref: 465_14350 **Date:** 12 – 16 July 2027 **Location:** London - Central London four-star **Fees:** 25300 SAR

Introduction:

Structural equation modeling SEM lets researchers test a theory of unobservable constructs at once, yet many theses and journal submissions are returned because indicators were never validated, fit indices were read selectively, indirect effects were tested with outdated methods or the choice between covariance-based and PLS-SEM was never justified. This Core Concept course trains researchers and survey analysts to specify, estimate, assess and report latent-variable models in AMOS, SmartPLS and lavaan. Working on multi-discipline survey datasets, participants build an SEM Analysis and Reporting Pack with a validated measurement model, a tested structural model and a publication-ready results section.

Course Objectives:

- Specify latent constructs, indicators and hypothesised paths as a path diagram that matches the research model
- Choose between covariance-based SEM and PLS-SEM, and select an estimator, according to research aim, data type and sample
- Validate a measurement model through CFA loadings, composite reliability, average variance extracted and discriminant validity checks
- Estimate and evaluate structural models using global fit indices, path coefficients, explained variance and justified respecification
- Test mediation, moderation and group differences with bootstrapped indirect effects and multi-group comparisons
- Report SEM results in thesis chapters and journal manuscripts with tables, figures and transparent modelling decisions

Target Audience:

- Researchers who test theoretical models built on survey constructs such as attitudes, perceptions and behavioural intentions
- Doctoral and master's candidates whose thesis methodology requires latent-variable modelling
- Survey and insight analysts who validate multi-item scales and link them to outcome measures
- Academic staff who supervise or examine quantitative theses and review journal submissions
- Institutional research and evaluation staff who model drivers of satisfaction, engagement or performance

Course Outline:

Day 1: Latent Variables, Measurement Theory and the SEM Landscape

- Latent Constructs, Observed Indicators and Measurement Error in Classical Test Theory
- Reflective Versus Formative Measurement Models and Indicator Specification
- Measurement Model and Structural Model: Path Diagram Notation and Conventions
- Exploratory Versus Confirmatory Factor Analysis: Matching Each to the Research Question
- Data Screening for SEM: Sample Size, Multivariate Normality and Missing Data Handling

Day 2: Covariance-Based SEM, PLS-SEM and Estimation Frameworks

- Covariance-Based SEM Versus PLS-SEM: Theory Testing, Prediction and Selection Criteria
- Estimators Compared: Maximum Likelihood, Weighted Least Squares and DWLS for Ordinal Items
- Model Identification Rules: Degrees of Freedom, Latent Scaling and Marker Indicators
- AMOS Graphics Workspace: Drawing a CFA Model and Reading Output Tables
- lavaan Model Syntax in R: Measurement Operators and the cfa and sem Functions

Day 3: Measurement Model Assessment and Structural Model Estimation

- CFA Factor Loadings, Composite Reliability and Average Variance Extracted
- Discriminant Validity: Fornell-Larcker Criterion and HTMT Ratio
- Global Fit Indices: Chi-Square, CFI, TLI, RMSEA and SRMR Interpretation
- Structural Path Estimation: Standardised Coefficients, R-Squared and f-Squared Effect Size
- SmartPLS Model Build: PLS Algorithm, Bootstrapping and Path Significance

Day 4: Mediation, Moderation, Group Comparisons and Model Problems

- Mediation Analysis With Bootstrapped Indirect Effects and Confidence Intervals
- Moderation With Latent Interaction Terms and Moderated Mediation at Overview
- Multi-Group Analysis and Measurement Invariance: Configural, Metric and Scalar Levels at Overview
- Modification Indices, Heywood Cases and Post Hoc Respecification Risks
- Common Method Bias Checks and Equivalent Model Alternatives

Day 5: SEM Software Lab and the Analysis and Reporting Pack

- Organisational Behaviour Survey Lab: Full CB-SEM Workflow in AMOS
- Service Quality Survey Lab: PLS-SEM Workflow in SmartPLS
- Replicating the Lab Model in lavaan Script With Robust Estimation
- SEM Results Tables, Path Diagram Figures and Thesis Chapter Write-Up
- SEM Analysis and Reporting Pack Assembly and Reviewer-Style Critique

Skills You Will Gain:

- Latent Variable Modelling
- Confirmatory Factor Analysis
- Construct Validity Assessment
- Model Fit Evaluation
- Indirect Effect Testing
- PLS Path Modelling
- R lavaan Scripting
- SEM Results Reporting

Why Attend This Course:

- Return with an SEM Analysis and Reporting Pack: a validated measurement model, a tested structural model and a draft results section built in the lab
- Answer examiner and reviewer questions on fit, validity and method choice with evidence rather than a list of cut-off values
- Run the same model in AMOS, SmartPLS and lavaan and explain why the estimates differ between approaches
- Compare modelling decisions with researchers from management, education, health and social science fields

Conclusion:

A structural equation model is only as credible as its measurement model, its fit evidence and the transparency of its reporting. The one week move from latent constructs and measurement theory, through covariance-based and PLS-SEM frameworks and estimation, to CFA validity checks, fit indices and structural paths, then to mediation, moderation, group comparisons and model problems. The final day is a hands-on lab in AMOS, SmartPLS and lavaan that produces an SEM Analysis and Reporting Pack participants can carry into their thesis, manuscript or survey report.