Partial Least Squares Structural Equation Modeling (PLS-SEM):
Basic and Advanced Topics

Dates: **15-17 Sep 2020**
Location: **UBB-FSEGA Building**
Room: **Aula Victor Jinga**
Participants: **20**

1 Instructor

Prof. Dr. Marko Sarstedt
Professor of Marketing, Otto-von-Guericke-Universität Magdeburg
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and
Monash University Malaysia (Malaysia), Visiting Professor to the School of Business and Global Asia in the 21st Century Research Platform

2 Course objectives

Partial least squares structural equation modeling (PLS-SEM) has recently received considerable attention in a variety of disciplines, including marketing, strategic management, management information systems, and many more.

PLS is a composite-based approach to SEM, which aims at maximizing the explained variance of dependent constructs in the path model. Compared to other SEM techniques, PLS allows researchers to estimate very complex models with many constructs and indicator variables. Furthermore, PLS-SEM allows to estimate reflective and formative constructs and generally offers much flexibility in terms of data requirements.

This three-day workshop introduces participants to the state-of-the-art of PLS-SEM using the SmartPLS 3 software. The first day provides a profound introduction to the basic principles of structural equation modeling, with special emphasis on construct operationalization. Participants will also learn the foundations of PLS-SEM and how to apply it by means of the SmartPLS software. For this purpose, the instructor will make use of several examples and exercises. The first day will also offer insights into the current debates about PLS-SEM in journals such as *Multivariate Behavioral Research*, *Organizational Research Methods*, *Journal of Business Research*, and *Journal of Operations Management*. Starting at the first day and continuing on the second day, the seminar will cover various aspects related to the evaluation of measurement and structural model results. The third day will cover advanced topics such as higher-order modeling, measurement invariance, multigroup analysis, and unobserved heterogeneity. The benefits of having such advanced PLS-SEM approaches readily at hand are tremendous, since these types of analyses assist in the evaluation of PLS-SEM estimations and are increasingly being requested by editors and reviewers. At the same time, however, applying these and other advanced PLS-SEM approaches requires understanding their intricacies and knowing when they can assist in analyzing data in a meaningful way such that the applications fit the research context.

3 Learning outcomes

This workshop is designed to familiarize with the potentials of using PLS-SEM in business research. The objectives of this course are to provide an in-depth methodological introduction into (1) the PLS-SEM approach (the nature of causal modeling, analytical objectives, some statistics), (2) the evaluation of measurement and structural model results, and (3) advanced analytical techniques. More specifically, participants will understand the following topics:

- Model development and fundamentals of PLS-SEM
- Current debates about PLS-SEM
- Assessment and reporting of measurement model results, including the new criterion for discriminant validity testing: The heterotrait-monotrait ratio of correlations (HTMT)
- Assessment and reporting of structural model results
- Mediating effects
- Moderating effects (interaction effects)
- Higher-order modeling
- Measurement invariance
- Multigroup analysis

This course has been designed for full-time faculty, PhD students, and practitioners who are interested in learning how to use the PLS-SEM method in their own research applications. A basic knowledge of multivariate statistics and SEM techniques is helpful, but not required.

4 Teaching and learning methods

- The course is based on the PLS-SEM textbooks:
  Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. 2nd edition. Thousand Oaks, CA: Sage.
  and
  Hair, J. F., Sarstedt, M., Ringle, C. M., and Gudergan, S. P. (2018). *Advanced Issues in Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Thousand Oaks: Sage.
- Presentations: The session will cover theory and its application.
- Computer exercises using the latest SmartPLS 3 version: Specifically, theoretical explanations underlying the software procedures and practical exercises where participants will apply their learning to real-world examples provided by the instructor.

5 Practical issues

- Bring your laptop computer and a 2 or 3-way power extension lead.
- Download and install the SmartPLS software from http://www.smartpls.com/ before coming to the workshop (participants will receive detailed instructions shortly before the course starts). All participants will receive a two-months professional license of SmartPLS.

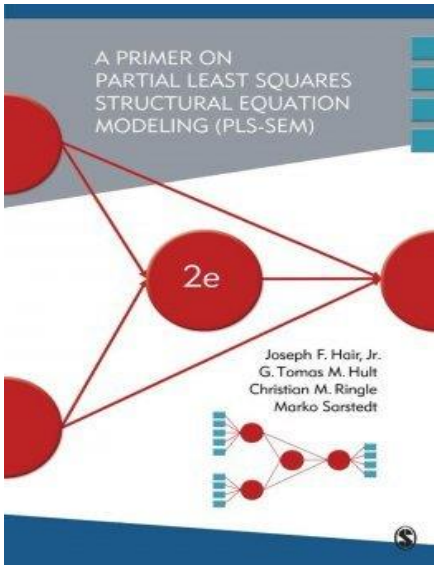
6 Teaching resources

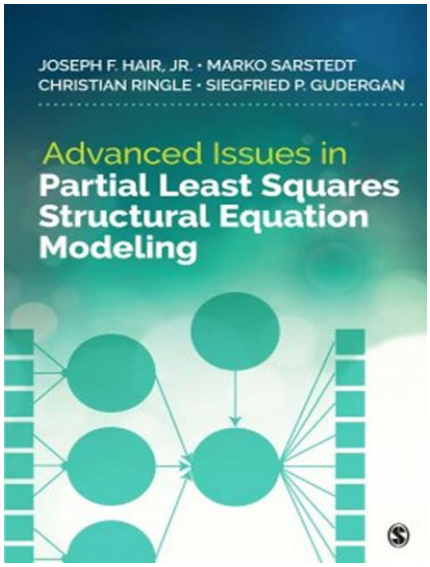
Comprehensive lecture slides will be provided to all participants

Books:

Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. 2nd edition. Thousand Oaks, CA: Sage.

Hair, J. F., Sarstedt, M., Ringle, C. M., and Gudergan, S. P. (2018). *Advanced Issues in Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Thousand Oaks: Sage.





Journal Articles (selection):

Franke, G., & Sarstedt, M. (2019). Heuristics Versus Statistics in Discriminant Validity Testing: A Comparison of Four Procedures. *Internet Research*, *29*(3), 430-447.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, Mirror on the Wall: A Comparative Evaluation of Composite-based Structural Equation Modeling Methods. *Journal of the Academy of Marketing Science*, *45*(5), 616-632.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to Use and How to Report the Results of PLS-SEM. *European Business Review*, *31*(1), 2-24.

Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., Ketchen, D. J. J., Hair, J. F., Hult, G. T. M., & Calantone, R. J. (2014). Common Beliefs and Reality about Partial Least Squares: Comments on Rönkkö & Evermann (2013). *Organizational Research Methods*, 17(2), 182-209.

Rigdon, E. E., Becker, J.-M., & Sarstedt, M. (2019). Factor Indeterminacy as Metrological Uncertainty: Implications for Advancing Psychological Measurement. *Multivariate Behavioral Research*, *54*(3), 429-443.

Rigdon, E. E., Sarstedt, M., & Becker, J.-M. (2020) Quantify Uncertainty in Behavioral Research. *Nature Human Behaviour*, *4*, 329-331.

Sarstedt, M., Hair, J. F., Ringle, C. M., Thiele, K. O., & Gudergan, S. P. (2016). Estimation Issues with PLS and CBSEM: Where the Bias Lies!, *Journal of Business Research*, 69(10), 3998-4010.

Sarstedt, M., Hair, J. F., Nitzl, C., Ringle, C. M., & Howard, M. C. (2020). Beyond a Tandem Analysis of SEM and PROCESS: Use PLS-SEM for Mediation Analyses! *International Journal of Market Research*, *62*(3), 288-299.

Sarstedt, M., Ringle, C. M., Cheah, J.-H., Ting, H., Moisescu, O. I. & Radomir, L. (2020). Structural Model Robustness Checks in PLS-SEM. *Tourism Economics*, Advance online publication.

Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J.-H., Ting, H., & Ringle, C. M. (2019). Predictive Model Assessment in PLS-SEM: Guidelines for Using PLSpredict. *European Journal of Marketing*, *53*(11), 2322-2347.

7 Schedule

Day	Time	Topic
Day 1 (**15 Sep 2020**)	09:00 – 10:30	Fundamentals of PLS-SEM
	10:30 – 10:45	Coffee break
	10:45 – 12:15	Assessment of measurement model results and exercises
	12:15 – 13:15	Lunch break
	13:15 – 14:45	Assessment of measurement model results and exercises
Day 2 (**16 Sep 2020**)	09:00 – 10:30	Assessment of PLS-SEM results and exercises
	10:30 – 10:45	Coffee break
	10:45 – 12:15	Moderation
	12:15 – 13:15	Lunch break
	13:15 – 14:45	Mediation
Day 3 (**17 Sep 2020**)	09:00 – 10:30	Higher-order Modeling
	10:30 – 10:45	Coffee break
	10:45 – 12:15	Measurement invariance
	12:15 – 13:15	Lunch break
	13:15 – 14:45	Multigroup analysis

8 Instructor's short bio

Marko Sarstedt is a Chaired Professor of Marketing at the Otto-von-Guericke-University Magdeburg (Germany) and Visiting Professor at the Monash University Malaysia (Malaysia). His main research interests are the advancement of research methods to further the understanding of consumer behavior. His research has been published in, for example, *Nature Human Behaviour*, *Journal of Marketing Research*, *Journal of the Academy of Marketing Science*, *International Journal of Research in Marketing*, *Organizational Research Methods*, *Multivariate Behavioral Research*, *MIS Quarterly*, *Psychometrika*, *Journal of Business Research*, *Journal of World Business*, *Marketing Letters*, and *Long Range Planning*. Marko has co-edited several special issues of leading journals and co-authored five widely adopted textbooks, including "A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)" (together with Joe F. Hair, G. Tomas M. Hult, and Christian M. Ringle). His research ranks among the most frequently cited in the social sciences with more than 50,000 citations according to Google Scholar. Marko has won numerous best paper and citation awards, including five Emerald Citations of Excellence awards. His research has been covered by the leading media outlets such as Die Zeit, Huffington Post, and Spiegel and has been featured in documentaries on consumer behavior on arte and MDR as well as on the scientific video platform Latest Thinking. According to the 2019 F.A.Z. ranking, he is among the three most influential researchers in Germany, Austria, and Switzerland. Marko has been named member at Clarivate Analytic's 2019 Highly Cited Researcher List, which includes the "world's most impactful scientific researchers."