



WORKSHOP #3

Advanced Issues in Partial Least Squares Structural Equation Modeling (PLS-SEM)

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1 Instructors

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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 one-day workshop introduces participants to the state-of-the-art of PLS-SEM using the SmartPLS 3 software. After a brief recap of the foundations of the method, the workshop will cover several advanced topics, related to model specification, evaluation, and estimation using PLS-SEM. Specifically, the workshop will first deal with higher-order constructs, which have recently gained popularity among users of the PLS-SEM method. Next, the workshop will cover recently proposed metrics for predictive model assessment (e.g., PLSpredict), including predictive model comparisons. Finally, the workshop will deal with the treatment of heterogeneity, including measurement invariance assessment and multigroup comparisons. The workshop will also offer an outlook on latent class procedures (FIMIX-PLS and PLS-POS) for identifying and treating unobserved heterogeneity.

3 Learning outcomes

This workshop is designed to familiarize with the potentials of using PLS-SEM in research. The objectives of this course are to introduce advanced issues, extensions and new developments to PLS-SEM. Editors and reviewers of top-level journals often require this knowledge when they receive submissions. Participants will understand the following topics:

- Higher-order constructs (e.g., second-order constructs),
- Prediction-oriented results analysis including (e.g., PLSpredict),
- Measurement invariance testing (MICOM),
- Multigroup analysis, and
- Outlook on latent class procedures (FIMIX-PLS and PLS-POS).

This course has been designed for PhD students who are interested in learning how to use recent advances in PLS-SEM in their own research. Participants should have a background in PLS-SEM, used the method, and applied the SmartPLS software before.

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.
 - 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, CA: 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 instructors.

5 Registration and practical issues

- Conference participants can register for the workshop as part of the conference registration process. Please visit: <https://www.pls2020.org>
- 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 – including a two-months license key – shortly before the course starts.

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):

- Becker J.-M., Rai A., Ringle C. M., & Völckner, F. (2013). Discovering Unobserved Heterogeneity in Structural Equation Models to Avert Validity Threats. *MIS Quarterly*, 37(3), 665-694.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., and 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., Sarstedt, M., & Ringle, C. M. (2019). Rethinking Some of the Rethinking of Partial Least Squares, *European Journal of Marketing*, forthcoming.
- Henseler, J., Ringle, C. M., and Sarstedt, M. (2016). Testing Measurement Invariance of Composites Using Partial Least Squares. *International Marketing Review*, 33(3), 405-431
- Matthews, L. (2017). Applying Multigroup Analysis in PLS-SEM: A Step-by-Step Process. In H. Latan and R. Noonan (Eds.), *Partial Least Squares Path Modeling. Basic Concepts, Methodological Issues and Applications* (pp. 219-243). Berlin: Springer.
- Rigdon, E. E., Becker, J.-M., and Sarstedt, M. (2019). Factor Indeterminacy as Metrological Uncertainty: Implications for Advancing Psychological Measurement. *Multivariate Behavioral Research*, forthcoming.
- Rigdon, E. E., Sarstedt, M., and Ringle, C. M. (2017). On Comparing Results from CB-SEM and PLS-SEM. Five Perspectives and Five Recommendations. *Marketing ZFP*, 39(3), 4-16.
- Sarstedt, M., Ringle, C. M., and Gudergan, S. P. (2016). Guidelines for Treating Unobserved Heterogeneity in Tourism Research: A Comment on Marques and Reis (2015), *Annals of Tourism Research*, 57, 279-284.
- Sarstedt, M., Ringle, C. M. and Hair, J. F. (2017). Treating Unobserved Heterogeneity in PLS-SEM: A Multi-Method Approach. In H. Latan and R. Noonan (Eds.), *Partial Least Squares Path Modeling. Basic Concepts, Methodological Issues and Applications* (197-217), Berlin: Springer.
- Sharma, P. N., Sarstedt, M., Shmueli, G., and Thiele, K. O. (2019). PLS-based Model Selection: The Role of Alternative Explanations in IS Research. *Journal of the Association for Information Systems*, forthcoming.
- Sharma, P. N., Shmueli, G., Sarstedt, M. Danks, N., and Ray, S. (2019). Prediction-oriented Model Selection in Partial Least Squares Path Modeling. *Decision Sciences*, forthcoming.
- Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J.-H., Ting, H., Vaithilingam, S., and Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: guidelines for using PLSpredict, *European Journal of Marketing*, forthcoming.

7 Schedule

Location: Conference Center, Beihang University, Beijing China

Time	Topic
09:00 – 10:30	Recap: foundations of PLS-SEM Prediction-oriented assessment in PLS-SEM
10:30 – 10:45	Break
10:45 – 12:15	Higher-order constructs
12:15 – 13:15	Lunch
13:15 – 15:00	Measurement model invariance (MICOM)
15:00 – 15:15	Break
15:15 – 17:00	Multigroup analysis Outlook on latent class procedures (FIMIX-PLS and PLS-POS)

8 Instructor's short bio

Marko Sarstedt is a Chaired Professor of Marketing at the Otto-von-Guericke-University Magdeburg (Germany) and Adjunct Professor at the Monash University Malaysia (Malaysia). His main research interests are in the advancement of research methods to further the understanding of consumer behavior. His research has been published in, for example, *Journal of Marketing Research*, *Journal of the Academy of Marketing Science*, *International Journal of Research in Marketing*, *Organizational Research Methods*, *Multivariate Behavioral Research*, *Decision Sciences*, *MIS Quarterly*, *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 four 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). Marko's works have been awarded with several citation and best paper awards. According to the 2018 F.A.Z. ranking, he is among the three most influential economists in the category research. He has recently been included in the Clarivate Analytics' Highly Cited Researchers list. Additional information: <http://www.marketing.ovgu.de>

Christian M. Ringle is a Chaired Professor of Management and the Director of the Institute of Human Resource Management and Organizations (HRMO) in the Department of Management Sciences and Technology at the Hamburg University of Technology (TUHH), Germany, and a Conjoint Professor of the Waikato Management School, New Zealand. He holds a PhD from the Faculty of Business and Economics at the University of Hamburg. Amongst other research stays and appointments, Ringle was a visiting researcher at the Georgia State University and the Osaka City University and he was a Conjoint Professor at the University of Technology Sydney and the University of Newcastle in Australia. His research addresses human resource management, organization, marketing, strategic management, and quantitative methods for business and market research. His contributions in these fields have been published in journals such as *International Journal of Research in Marketing*, *Information Systems Research*, *Journal of Business Research*, *Journal of Leisure Research*, *Journal of Service Research*, *Journal of the Academy of Marketing Science*, *Long Range Planning*, *MIS Quarterly*, and *Tourism Management*. Recently, he has been included in the 2018 Clarivate Analytics' Highly Researchers list. More information on Christian M. Ringle and his list of publications: <http://www.tuhh.de/hrmo/team/prof-dr-c-m-ringle.html>

Jan-Michael Becker is a postdoctoral researcher and lecturer in Marketing at the University of Cologne in Germany. He has been a visiting scholar at leading international business schools like Georgia State University, Atlanta, USA and University of Waikato, Hamilton, New Zealand. His research interests focus on structural equation modeling (SEM), PLS path modeling, unobserved heterogeneity, and measurement theory, as well as bridging marketing and IS problems. His research has been published in several premier academic journals, including *Information Systems Research*, *MIS Quarterly*, *Long Range Planning*, *Multivariate Behavioral Research*, and *European Management Journal*. He is a co-founder of the SmartPLS software application. More information on Jan-Michael Becker and his list of publications: <https://www.marketing.uni-koeln.de/de/team/jan-michael-becker/>