|  |  |  |
| --- | --- | --- |
| **PGR Course unit outline 2020/21** | | |
| **Unit code:** | **BMAN *(to be confirmed by PGR Office)*** | |
| **Title:** | **Partial least squares structural equation modelling (PLS-SEM) Using SmartPLS 3** | |
| **Credit value:** | **7.5** | |
| **Semester:** | **2** | |
| **Course Coordinator**  **contact details:** | **Prof Christian Ringle** | |
| **Other staff involved contact details:** | N/A | |
| **Pre-requisites**  **Co-requisites**  **Dependent course units**  **Restrictions** | None but some basic statistics and methods knowledge may be useful. | |
| **Course unit overview** | | |
| This course introduces the participants to the state-of-the-art of partial least squares structural equation modeling (PLS-SEM; Hair, Hult, Ringle, & Sarstedt, 2017; Hair, Risher, Sarstedt, & Ringle, 2019; Sarstedt, Ringle, & Hair, 2017) using [the SmartPLS 3 software](http://www.smartpls.com) (Ringle, Wende, & Becker, 2015). PLS-SEM is a composite-based approach to SEM, which aims at maximizing the explained variance of dependent constructs in the path model. Researchers and practitioners use PLS-SEM especially when they conduct studies on success factors and the sources of competitive advantage.  Compared to other SEM techniques, PLS-SEM 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. The goal of PLS-SEM is the explanation of variances (prediction-oriented character of the methodology) rather than explaining covariances (theory testing via covariance-based SEM, CB-SEM). The application of the PLS-SEM method is of high interest if the assumptions of CB-SEM are violated and the proposed cause-and-effect relationships are not sufficiently explored. An additional advantage of the PLS-SEM method is the unrestricted inclusion of latent variables in small to very complex path models that draw on either/both reflective and formative measurements models. PLS-SEM has received considerable attention in a variety of disciplines (e.g., Ali, Rasoolimanesh, Sarstedt, Ringle, & Ryu, 2018; Khan et al., 2019; Nitzl & Chin, 2017; Ringle, Sarstedt, Mitchell, & Gudergan, 2020), which resulted in several highly cited publications (e.g., Web of Science). | | |
| **Aims** | | |
| This course is based on the textbook by Hair et al. (2017). It is designed to look at the stages of research question development and theorizing together with the subsequent methodological implementation using the multivariate analysis method PLS-SEM in business and management research. The learning objectives are to (1) contribute to theory by establishing a useful PLS path model, (2) develop an in-depth methodological appreciation of the PLS-SEM approach (the nature of theoretical modelling, analytical objectives, and related statistics), (3) acquire knowledge to evaluate measurement results, and (4) understand complementary analytical techniques. | | |
| **Objectives (Learning outcomes)** | | |
| Specifically, following the course participants will understand the following topics:   * Model development and fundamentals of PLS-SEM. * The PLS-SEM algorithm and weighted PLS (WPLS) algorithm to estimate PLS path models. * Assessment and reporting of measurement model results. * Significance testing based on bootstrapping. * Assessment and reporting of structural model results. * New criteria for model assessment such as HTMT for discriminant validity. * Prediction-oriented results analysis including PLSpredict.   In addition, the participants will be able to use the SmartPLS 3 software for their PLS-SEM analyses. | | |
| **Syllabus content** | | |
| This course is conducted entirely online.  Timetable and contents:    Case studies and an introduction of the SmartPLS software application are integral elements of the course.  The course uses the software SmartPLS 3 Professional for all PLS-SEM applications and exercises.  All participants get a full functional 60 days SmartPLS 3 Professional license key. Please visit  https://www.smartpls.com/ to download and install the latest version of the software. | | |
|  | | |
| **Lectures** | | 16 hours over 2 days |
| **Seminar/Tutorial/Workshop/Lab Hours** | | 8 hours x 2 consecutive days |
| **Independent Study** | | 59 hours |
| **Total Study Hours** | | 75 hours (16 hours taught + 59 hours independent study) |
| **Reading List** | | |
| **Pre Reading**: None  **Core Text:**  Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2 ed.). Thousand Oaks, CA: Sage.  **Supplementary Text**:  Ali, F., Rasoolimanesh, S. M., Sarstedt, M., Ringle, C. M., & Ryu, K. (2018). An Assessment of the Use of Partial Least Squares Structural Equation Modeling (PLS-SEM) in Hospitality Research. *International Journal of Contemporary Hospitality Management, 30*(1), 514-538.  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.  Khan, G. F., Sarstedt, M., Shiau, W.-L., Hair, J. F., Ringle, C. M., & Fritze, M. (2019). Methodological Research on Partial Least Squares Structural Equation Modeling (PLS-SEM): An Analysis Based on Social Network Approaches. *Internet Research, 29*(3), 407-429.  Nitzl, C., & Chin, W. W. (2017). The Case of Partial Least Squares (PLS) Path Modeling in Managerial Accounting. *Journal of Management Control, 28*(2), 137-156.  Ringle, C. M., Sarstedt, M., Mitchell, R., & Gudergan, S. P. (2020). Partial Least squares Structural Equation Modeling in HRM Research. *The International Journal of Human Resource Management, 31*(12), 1617-1643.  Ringle, C. M., Wende, S., & Becker, J.-M. (2015). SmartPLS 3. Bönningstedt: SmartPLS. Retrieved from http://www.smartpls.com  Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial Least Squares Structural Equation Modeling. In C. Homburg, M. Klarmann, & A. Vomberg (Eds.), *Handbook of Market Research* (pp. 1-40). Cham: Springer. | | |
| **Assessment** | | |

|  |  |  |
| --- | --- | --- |
| **Mode of Assessment** | **Length required** | **Weighting within unit** |
| **Course participation (case studies)** | To be announced | 40% |
| **Take home exam** | To be announced | 60% |

|  |
| --- |
| **Feedback methods** |
| **Students provide feedback in the course and via email.** |

**Timetable and contents**

|  |  |  |
| --- | --- | --- |
| **Date** | **Time** | **Content** |
| **Day 1** | 9:00 - 10:30 | Foundations of structural equation modelling |
| 10:00 - 11:00 | *Morning break* |
| 11:00 - 12:30 | The nature of latent variables and specifying the measurement model  (reflective / formative) |
| 12:30 - 13:30 | *Lunch break* |
| 13:30 - 15:00 | Introduction to PLS-SEM and the SmartPLS software |
| 15:00 - 15:30 | *Afternoon break* |
| 15:30 - 17:00 | Model estimation: the PLS-SEM algorithm and the weighted PLS-SEM algorithm (WPLS) & SmartPLS exercises |
| **Day 2** | 9:00 - 10:30 | Assessing reflective measurement models & SmartPLS exercises |
| 10:00 - 11:00 | *Morning break* |
| 11:00 - 12:30 | Assessing formative measurement models & SmartPLS exercises |
| 12:30 - 13:30 | *Lunch break* |
| 13:30 - 15:00 | Assessing structural model results & SmartPLS 3 exercises |
| 15:00 - 15:30 | *Afternoon break* |
| 15:30 - 17:00 | Prediction-oriented results assessment (PLSpredict) & SmartPLS 3 exercises Wrap-up |

**Dr. Christian M. Ringle**, Professor of Management,   
Hamburg University of Technology (TUHH), Germany, *and* University of Waikato, New Zealand

**Type of course**

This course will completely delivered online.

**Software**

The course uses the software SmartPLS 3 Professional for all PLS-SEM applications and exercises. All participants get a full functional 60 days SmartPLS 3 Professional license key. Please visit <https://www.smartpls.com/> to download and install the latest version of the software.

**Instructor’s short bio**

**Christian M. Ringle** is a chaired professor of management at the Hamburg University of Technology (Germany) and an adjunct professor at the University of Waikato (New Zealand). His research addresses management of organizations, human resource management, methods development for business analytics and their application to business research. His contributions in these fields have been published in journals such as International Journal of Research in Marketing, Information Systems Research, Journal of the Academy of Marketing Science, MIS Quarterly, Organizational Research Methods, and The International Journal of Human Resource Manage­ment. Since 2018, he has been named member of Clarivate Analytics’ Highly Cited Researchers List. In 2014, Christian co-founded SmartPLS (http://www.smartpls.com), a software tool with a graphical user interface for the application of the partial least squares structural equation modeling (PLS-SEM) method. Besides supporting consultancies and international corporations, he regularly teaches doctoral seminars on business analytics and multivariate statistics, the PLS-SEM method, and the use of SmartPLS worldwide.   
More information about Christian M. Ringle can be found at https://www.tuhh.de/hrmo/team/prof-dr-c-m-ringle.html.