



**University of  
Zurich<sup>UZH</sup>**

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**Meeting of the  
Working Group Structural Equation Modeling**  
7-8 April, 2016  
Zurich

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Universität Zürich  
Soziologisches Institut  
Andreasstrasse 15  
8050 Zürich  
(Room AND 3.46)

## Time Schedule - SEM Meeting

**Thursday, 07.04.2016**

<b>10:30 - 10:45</b>	<b>Arrival</b>	
<b>10:45 - 11:00</b>	<b>Opening</b>	
<b>11:00 - 11:30</b>	Partial least squares path modeling using ordinal categorical indicators	Schuberth et al.
<b>11:30 - 12:00</b>	Reliability estimation of nonstandard SEM measurement models	Garst
<b>12:00 - 12:30</b>	The impact of response shift on the assessment of change: Calculation of effect-size indices using structural equation modeling	Verdam et al.
<b>12:30 - 14:00</b>	<b>Lunch</b>	
<b>14:00 - 14:30</b>	Assessing Item Measurement Invariance in Large Scale Cross-Country Surveys. Monte Carlo Simulation Study	Pokropek
<b>14:30 - 15:00</b>	Bayesian structural equation modeling: sensitivity to the prior and an exploration of robust priors	Oberski et al.
<b>15:00 - 15:30</b>	Combining approximate zero constraints for measurement invariance and cross-loadings: An application of dual process growth curve models with panel data	Seddig
<b>15:30 - 16:00</b>	<b>Coffee break</b>	
<b>16:00 - 16:30</b>	Only approximately comparable: Results of approximate invariance testing of values across European countries across various rounds of the European Social Survey	Cieciuch et al.
<b>16:30 - 17:00</b>	Testing for Measurement Invariance of the Portrait Value Questionnaire in Germany, China and Russia	Heim et al.
<b>17:00 - 17:30</b>	Explaining measurement non-equivalence using multilevel structural equation modeling: The case of attitudes toward citizenship rights	Dülmer et al.
<b>17:30 - 17:40</b>	<b>Short break</b>	
<b>17:40 - 18:10</b>	Meeting of the SEM working group	Jost Reinecke, Peter Schmidt
<b>19:00</b>	<b>Dinner</b>	

**Friday, 08.04.2016**

<b>10:00 - 10:30</b>	Structural equation models and confirmatory factor analysis in small samples: theory and applications	Srakar
<b>10:30 - 11:00</b>	The stay-leave decisions of battered women in Bolivia: Results from a longitudinal study	Heim et al.
<b>11:00 - 11:30</b>	Modeling Effects of State and Trait Absorption on Aesthetic Appreciation of Music	Vroegh
<b>11:30 - 12:00</b>	To MIMIC or not to MIMIC: estimating the size of the shadow economy	Hassan
<b>12:00</b>	<b>Farewell, lunch</b>	

## **Presentations - SEM Meeting**

**Thursday, 7.04.2016**

### **Partial least squares path modeling using ordinal categorical indicators**

Florian Schuberth<sup>1</sup>, Jörg Henseler<sup>2</sup>, Theo K. Dijkstra<sup>3</sup>

<sup>1</sup> University of Würzburg, <sup>2</sup> University of Twente, <sup>3</sup> University of Groningen

We introduce a new variance-based estimator called consistent ordinal partial least squares (OrdPLSc) which is able to deal with common factors, composites, and ordinal categorical indicators in structural equation models with latent variables. Besides providing the theoretical background, we ran a Monte Carlo simulation to assess the quality of OrdPLSc under various conditions. We consider one classical common factor model and one model containing two composites and one common factor. In addition, we varied the number of categories and indicators skewness in each model. The results showed that OrdPLSc is an appropriate estimator for models containing constructs modeled as composites and common factors, and ordinal categorical indicators. Moreover, OrdPLSc produced consistent and similar results compared to its covariance-based counterpart WLSMV, but was less efficient. In this context, we also investigated the performance of PLS, PLSc, and OrdPLS. The Monte Carlo simulation confirmed that OrdPLS and PLS estimates are biased as common factors are included in the model. While PLSc only corrects for attenuation, its estimates analogous to PLS estimates, still suffers from the fact that the indicators scales is not taken into account. Nevertheless, PLSc produced almost unbiased path coefficient estimates, however, estimated factor loadings and weights are biased as ordinal categorical indicators are included in the model.

### **Reliability estimation of nonstandard SEM measurement models**

Harry Garst

University of Amsterdam

Reliability of reflective constructs can be estimated using Structural Equation Modeling. Raykov demonstrated how to setup the LISREL syntax to calculate reliability using the estimated parameters of the measurement model. In Lavaan it is possible to estimate several reliability indices using the R package semTools.

In this presentation I will demonstrate how to derive reliability estimates for nonstandard models.

## The impact of response shift on the assessment of change: Calculation of effect-size indices using structural equation modeling

M.G.E. Verdam, F.J. Oort, M.A.G. Sprangers

University of Amsterdam

**Aims.** The investigation of response shift in health-related quality of life (HRQL) outcomes is important in both clinical practice and research. Taking into account response shift effects provides a more valid assessment of change. In this paper we illustrate how to assess the impact of response shift on the assessment of change, through the calculation of effect-size indices of change.

**Method.** Structural equation modeling (SEM) can be used for the decomposition of change using:  $\mu_2 - \mu_1 = (\tau_2 - \tau_1) + ((\Lambda_2 - \Lambda_1)\kappa_2) + \Lambda_1\kappa_2$ , where observed change is decomposed into: 1) change due to recalibration response shift, 2) change due to reprioritization and/or reconceptualization response shift, and 3) change due to the underlying construct (e.g., HRQL; ‘true’ change). Subsequently, calculating effect-size indices of change (i.e., Cohen’s  $d$ , where  $d = \frac{\hat{\mu}_2 - \hat{\mu}_1}{\hat{\sigma}_{diff}}$ ) enables evaluation and interpretation of the clinical significance of the different types of change.

**Results.** We aim to illustrate the calculation of effect-size indices of change for the different types of response shift effects, and explain how to interpret the impact of possible response shifts on the assessment of change. Using data from 485 cancer patients that filled in the Mental Health subscale of the SF-36 (Ware, et al., 1993), we discuss the occurrence of different types of change (i.e., response shifts and ‘true’ change), and different sizes of effects. In addition, we aim to compare these effect-size indices with other well-known types of effect-size indices.

**Conclusions.** SEM can be used to enable the evaluation and interpretation of the impact of response shift effects on the assessment of change, particularly through calculation of effect-size indices of change. Insight into the occurrence *and* clinical significance of possible response shift effects will help to better understand changes in HRQL.

## Assessing Item Measurement Invariance in Large Scale Cross-Country Surveys. Monte Carlo Simulation Study

Artur Pokropek

Polish Academy of Sciences

In many large scale cross-national studies different statistical methods are used to assess equivalence of items across countries. However, surprisingly little was done to assess the efficiency of those methods in the context of large-scale cross-national studies. Most of previous Monte Carlo studies cover limited number of scenarios and different methods have not been compared extensively. In this presentation five methods of detecting nonequivalent items across groups are compared and tested using Monte Carlo simulations: (1) Multi-Group Confirmatory Factor Model (2) Generalized regression approach; (3) Multilevel Confirmatory Factor Analysis (4) BSEM approach; (5) Sequential comparisons used in alignment optimization. All of those methods offer radically different approaches. Methods one and two might be consider as classical fixed mode measurement equivalence models, the remaining three are approximate measurement equivalence models. The methods are assessed according to power, type I error and speed of computations. Detection of non-equivalent items is being tested in different scenarios including number of groups, sample size and type of non-equivalence.

## **Bayesian structural equation modeling: sensitivity to the prior and an exploration of robust priors**

Daniel Oberski, Sara van Erp, Joris Mulder

Tilburg University

Bayesian versions of SEM (BSEM) are becoming more popular, as they are thought to have some advantages in the case of small samples, nonconvergence, inadmissible estimates, models requiring numerical integration, and interest on functions of parameters such as the indirect effect. Furthermore, several authors have argued that BSEM allows the researcher to relax assumptions that certain parameters equal zero exactly.

Since BSEM works by combining the SEM likelihood with a Bayesian prior, the choice of prior attains vital importance. If the priors are too weak, the advantages of BSEM will not accrue, whereas too-strong priors will influence the posterior estimates unduly, resulting in bias.

In this presentation I will discuss work done in Tilburg to investigate (1) how sensitive BSEM estimates of interest are to the choice of prior, (2) how applied researchers can investigate such bias themselves by performing prior sensitivity analysis, and (3) whether automatic choices of priors can be found that strike a balance between the advantages of BSEM and the risks of bias. Some preliminary results of simulation studies as well as an example application to a classic BSEM analysis will be discussed.

## **Combining approximate zero constraints for measurement invariance and cross-loadings: An application of dual process growth curve models with panel data**

Daniel Seddig

University of Zurich

The study investigates a common developmental pattern of hedonistic beliefs and associations with delinquent peer groups in adolescence. Based on theory and previous research it is assumed, that the two latent variables ('hedonism' and 'association') are partly intertwined as some indicators seem to be co-determined from both dimensions. Thus, a modeling strategy for the parallel processes has to take into account measurement invariance (MI) and cross-loadings (CLs) simultaneously. With Bayesian structural equation modeling (BSEM), exact zero parameter constraints for MI and CLs can be relaxed with zero mean, small variance priors to yield approximate zero constraints, and to assure a more reasonable representation of substantive assumptions. The simultaneous assessment of approximate MI and CLs in multivariate latent growth models is demonstrated using panel data for  $n = 1,186$  adolescents from the German criminological study "Crime in the modern city".

## **Only approximately comparable: Results of approximate invariance testing of values across European countries across various rounds of the European Social Survey**

Jan Cieciuch<sup>1</sup>, Eldad Davidov<sup>1</sup>, Peter Schmidt<sup>2</sup>, René Algesheimer<sup>1</sup>,

<sup>1</sup> University of Zurich

<sup>2</sup> University of Giessen

Measurement invariance is a necessary precondition for meaningful cross-country comparisons, and three levels have been differentiated: configural, metric, and scalar. Unfortunately, establishing the most stringent form, i.e., scalar measurement invariance, across groups is very difficult. This was also the case for human values in European Social Survey (ESS). As was shown by Davidov (Davidov, Schmidt, Schwartz, 2008; Davidov, 2008, 2010) mean values measured by PVQ-21 in the European Social Survey (ESS) could not be compared across all countries because scalar measurement invariance was not supported. Recently, Muthén and Asparouhov proposed testing for approximate rather than exact measurement invariance as this may be sufficient for meaningful comparisons. Following their strategy, the results of cross-country approximate measurement invariance tests of the PVQ-21 scale to measure values in ESS are presented (respondents from 15 countries participating in six rounds). Applying the new approximate method for the test of measurement invariance showed that although exact measurement invariance cannot be established, approximate measurement invariance is present for some values across subsets of countries. In particular, approximate measurement invariance was established in almost all rounds for self-enhancement (8 countries), self-transcendence (12 countries), and conservation (10 countries).

## **Testing for Measurement Invariance of the Portrait Value Questionnaire in Germany, China and Russia**

Eva Heim<sup>1</sup>, Saskia Scholten<sup>2</sup>, Andreas Maercker<sup>1</sup>, Jürgen Margraf<sup>2</sup>,

<sup>1</sup> University of Zurich

<sup>2</sup> Ruhr-Universität Bochum

This study examined the measurement invariance (MI) of the Portrait Value Questionnaire (PVQ-21) by Shalom Schwartz across China, Russia and Germany. The MI of different versions of the PVQ has repeatedly been tested in the European Social Survey, but not in East Asian countries such as China. University students from Germany (N= 1'118), China (N= 9'601), and Russia (N= 3'890) completed the PVQ-21. Confirmatory Factor Analysis (CFA) was conducted separately for each country. According to the Schwartz value theory, the ten values measured with the PVQ are allocated on four higher-order factors. Due to high correlation between the ten values, the "magnifying glass strategy" was applied in this study, which means that the four higher-order factors were analysed separately. Using Multi-Group CFA, full metric and partial scalar invariance models held for three higher-order factors. Fit-indices for the fourth factor (openness-to-change) implied good model fit for partial metric invariance and only just failed partial scalar invariance. Latent mean comparisons showed a higher level of self-enhancement and conservation in China compared to Russia and Germany. This result from China is consistent with Confucian tradition on the one hand, and the highly competitive environment due to rapid economic change on the other hand.

## **Explaining measurement non-equivalence using multilevel structural equation modeling: The case of attitudes toward citizenship rights**

Hermann Dülmer<sup>1</sup>, Eldad Davidov<sup>2</sup>, Jan Cieciuch<sup>3</sup>, Anabel Kuntz<sup>2</sup>, Daniel Seddig<sup>2</sup>, Peter Schmidt<sup>4</sup>

<sup>1</sup> University of Cologne and University of Würzburg

<sup>2</sup> University of Zurich

<sup>3</sup> University of Zurich and Cardinal Stefan Wyszyński University

<sup>4</sup> University of Giessen

Several researchers have suggested that findings of cross-cultural non-equivalence may be a useful source of information about cross-cultural differences and proposed employing a multilevel structural equation modeling (MLSEM) approach to explain why equivalence is not given. In the current study we utilize this method and data from the International Social Survey Program (ISSP) national identity module (2003) to test for the cross-country equivalence of a scale measuring attitudes toward granting citizenship rights to immigrants. As expected, the scale fails to achieve scalar equivalence. However, we explain a significant part of the variance of the most non-equivalent intercept by a latent between-level factor and one contextual variable, namely, the percentage of foreigners in the country. We show that the method does not necessarily rectify non-equivalence but it can help to explain why it is absent.

**Key words:** measurement equivalence; multilevel structural equation modeling; ISSP; percentage of foreigners in the country; attitudes toward granting citizenship rights to immigrants

**Presentations – SEM Meeting**  
**Friday, 8.04.2016**

**Structural equation models and confirmatory factor analysis in small samples: theory and applications**

Andrej Srakar

University of Ljubljana

Small sample issues can arise commonly in structural equation models. Particularly pressing is the issue with cross-country (macroeconomic) data when usually the sample is limited to only a handful of countries. In this case, large sample theory, on which almost all modeling statistics are based, cannot be invoked for model evaluation with test statistics (see e.g. Bentler & Yuan 1999; Wolter 2007; Lumley 2004; 2010). In our article we will survey over the literature on high-dimensionality issues in structural equation models (and, particularly, confirmatory factor analysis) and present some new theoretical results on the possibilities to use in such cases. We will apply the theoretical results on the index of sustainable development, built from the database of Eurostat – Sustainable Development Indicators (<http://ec.europa.eu/eurostat/web/sdi/indicators>) which include data on indicators for sustainable development for more than 130 indicators for EU-28 countries in the period 1990-2013 (see Srakar & Vecco, forthcoming). We will use the results for the CFA validation of the resulting index and test the dynamic SEM model (see e.g. Cziráky 2004) with relationships among the resulting dimensions/components of the index. In conclusion, we will reflect on the possibilities of structural equation modeling in the present age of data-rich environments.

**The stay-leave decisions of battered women in Bolivia: Results from a longitudinal study**

Eva Heim<sup>1</sup>, Peter Schmidt<sup>2</sup>, Daniel Seddig<sup>1</sup>

<sup>1</sup> University of Zurich

<sup>2</sup> University of Giessen

This study examined women's decision to stay with or leave their violent partner in a sample of Bolivian women. A reduced form of the Theory of Planned Behavior (ToPB) was used as a theoretical framework. According to ToPB, behavior is preceded by intention, and intention depends on outcome expectancies (OE) and perceived self-efficacy (SE). This model was tested using Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM). 135 women were longitudinally assessed three times over 6 months: Intention to leave, OE and SE were measured at T1 and T2; relationship status was assessed at T3. CFA showed good model fit for the cross-sectional and longitudinal measurement model. Latent means of OE about leaving and SE remained stable, whereas latent means of intention and OE about staying changed between T1 and T2. OE and SE predicted intention cross-sectionally at T1 and T2. The final longitudinal model included OE, SE and intention to leave at T1, intention to leave at T2, and relationship status at T3. Intention at T2 but not at T1 predicted relationship status at T3. Results suggest that the decision to leave was consolidated between T1 and T2, and expectancies about staying were particularly relevant to this decision.



## **Modeling Effects of State and Trait Absorption on Aesthetic Appreciation of Music**

Thijs Vroegh

Max Planck Institute for Empirical Aesthetics

Having an aesthetic experience when listening to music has repeatedly been understood as one in which the individual ‘immerses’ herself in the music. However, research has not yet differentiated between absorption’s hedonic and eudaimonic aftereffects. The current cross-sectional study investigated the role of both trait and state absorption in a sample of 223 subjects. In addition to absorption, mental imagery and positive emotion were measured. Two research questions concerning the mediating role of state absorption and the relative predictive power of state and trait aspects of absorption were addressed using structural equation modeling (SEM). The appropriate operationalization of state absorption as a 2nd order latent variable (including attentional focus, altered awareness, and meta-awareness) within the SEM model was one of the main goals of the study. Results suggested that the relationship between trait absorption and appreciation outcomes was completely mediated by state absorption. The predictive power of state absorption on the eudaimonic component appreciation indicated a moderate effect. This suggests that felt absorption particularly had an effect on the ‘meaningfulness’ part of music appreciation, and less on its entertainment value. It is proposed that absorption also plays a further role as a ‘catalyst’ for other experiential aspects within musical experience.

## **To MIMIC or not to MIMIC: estimating the size of the shadow economy**

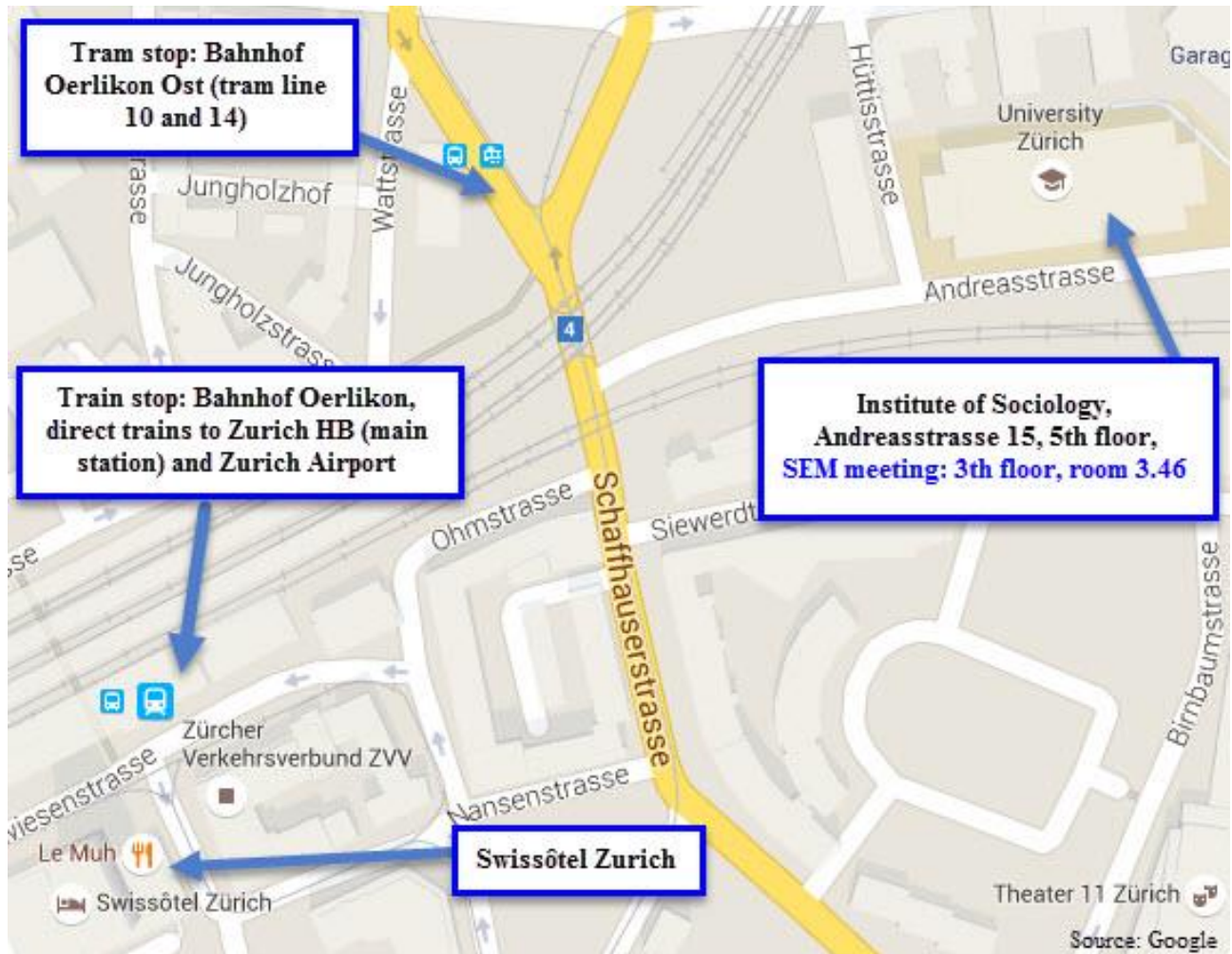
Mai Hassan

Philipps-University of Marburg

There is a growing interest on the application of Structural Equation Modelling (SEM) in the field of economics, particularly MIMIC models, to measure the unknown aspects of informal economies such as shadow economies, smuggling, etc. In my research, the MIMIC model has been of great advantage to measure the size of the shadow economy which is presented and published in prominent conferences and special issues. During the estimation of the MIMIC model, different methodological problems were encountered due to the quality and characteristics of the time series dataset given the assumptions of the SEM. In my paper, I present in detail the characteristics of the data, the problems faced and how I dealt with them to achieve satisfactory fit indices. My current work with the MIMIC model is on a cross sectional dataset to estimate the size of informality, yet it is still a very challenging task to apply the SEM on macroeconomic datasets. Given the growing interest on SEM, several economists argue against the application of SEM. Therefore, future research on SEM for economists and others is needed to add to its development and to the understanding of its application.

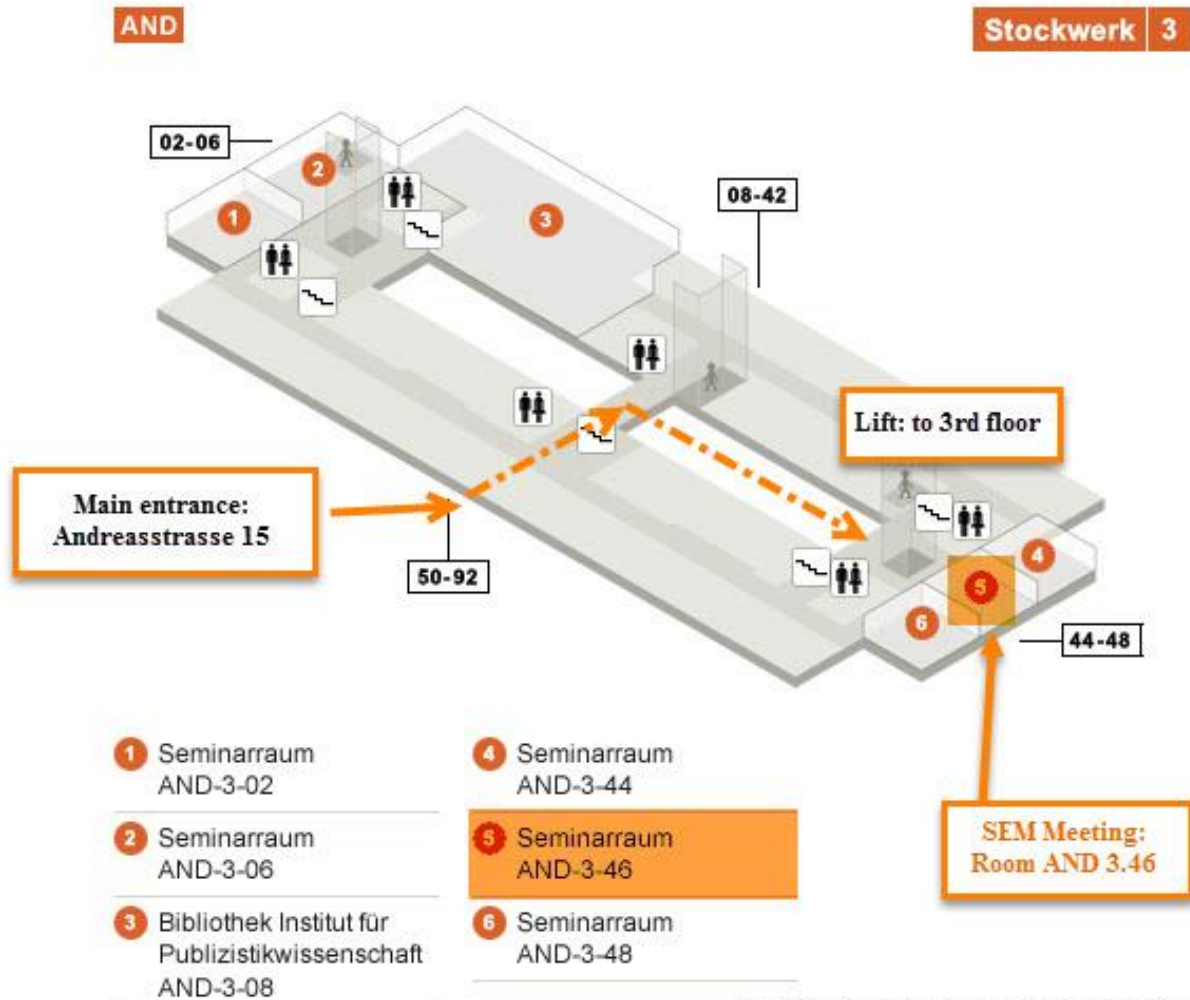
## Directions

There is a short walk of approximately 5 minutes from the train station “Bahnhof Oerlikon” or tram station “Bahnhof Oerlikon Ost” to get to the meeting venue at Andreasstrasse 15 (3<sup>rd</sup> floor, room 3.46). Please see the directions map below.



## Directions SEM Meeting Venue

Andreasstrasse 15, 8050 Zurich  
3<sup>rd</sup> floor, room 3.46



<https://www.plaene.uzh.ch/campus/N/schoolroom>

## Directions for dinner at Tibits Restaurant, Zurich NZZ Bistro, on 7 April, 2016

Tibits Zurich NZZ Bistro, Falkenstrasse 12, 8008 Zürich,  
<https://www.tibits.ch/en/restaurants.html>



## Accommodation

### Hotels in Zurich Oerlikon:

We especially recommend **Swissôtel** that is conveniently located opposite Oerlikon train station and less than 5 minutes on foot to the meeting venue: <http://www.swissotel.com/hotels/zurich/>

**Apartments Swiss Star, Zurich Oerlikon:** [http://www.apartments-swiss-star.ch/?page\\_id=137&lang=en](http://www.apartments-swiss-star.ch/?page_id=137&lang=en)

**Hotel Courtyard by Marriott Zurich North (*10-minute-walk to meeting venue*):**

<http://www.marriott.co.uk/hotels/travel/zrhcy-courtyard-zurich-north/>

**Hotel Holiday Inn Zurich Messe (< *10-minute-walk to meeting venue*):**

[http://www.holidayinn.com/hotels/gb/en/zurich/zrhme/hoteldetail?qAdlt=1&qBrs=6c.hi.ex.rs.ic.c.p.in.sb.cw.cv.ul.vn&qChld=0&qFRA=1&qGRM=0&qPSt=0&qRRSrt=rt&qRef=df&qRms=1&qRpn=1&qRpp=12&qSHp=1&qSmP=3&qSrt=sBR&qWch=0&srb\\_u=1&icdv=99600701&siclientid=1994&sitrackingid=59886406&glat=SEAR&dp=true&icdv=99600701#](http://www.holidayinn.com/hotels/gb/en/zurich/zrhme/hoteldetail?qAdlt=1&qBrs=6c.hi.ex.rs.ic.c.p.in.sb.cw.cv.ul.vn&qChld=0&qFRA=1&qGRM=0&qPSt=0&qRRSrt=rt&qRef=df&qRms=1&qRpn=1&qRpp=12&qSHp=1&qSmP=3&qSrt=sBR&qWch=0&srb_u=1&icdv=99600701&siclientid=1994&sitrackingid=59886406&glat=SEAR&dp=true&icdv=99600701#)

**Hotel Löwen (*10-minute-walk to meeting venue*):**

[http://www.eastotels.com/Hotel/Hotel\\_Lowen\\_Zurich.htm](http://www.eastotels.com/Hotel/Hotel_Lowen_Zurich.htm)

**Hotel Oerlikon Inn (< *10-minute-walk to meeting venue*):**

<http://www.hoteloerlikon.ch/en/home/>

**Hotel Sternen Oerlikon (< *10-minute-walk to meeting venue*):**

<http://www.sternenoerlikon.ch/en/home>