

**UNIVERSITI TEKNOLOGI MARA**

**A SIMULATION STUDY ON THE  
EFFECT OF ITEM-PARCELLING  
METHODS ON PARAMETER  
ESTIMATES AND MODEL FIT IN  
STRUCTURAL EQUATION  
MODELLING**

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## ABSTRACT

The assessment of parameter estimation and model fit are important in Structural Equation Modelling (SEM). Several goodness-of-fit (GoF) measures are affected by sample size and the number of parameters to be estimated. In SEM, a larger sample size is required to test a complex model involving large number of parameters to be estimated. One of the solutions is to reduce the number of parameters to be estimated in a given structural model by considering item-parcelling (IP). Although the use of IP is widely applied in research studies, parcelling of items still remain a controversial issue. The IP technique makes multidimensional constructs seem like unidimensional and may cause loss of information and the meaning of the latent construct. There is a need to examine and compare the item-level (IL) and IP models to determine if IP has a profound effect on the structural model parameter estimates and model fit measures. Previous research highlighted that the number of items for parcel and the method to create parcels are the main problematic issues in IP. There are many possible ways to allocate items to parcels and different ways of IP will generate different results for the structural model. Thus, this study determined the effects of IP based on different number of parcels on parameter estimates and model fit for normal and non-normal data in SEM. The data were simulated for IL and IP (2I6P, 3I4P, 4I3P, and 6I2P) models. Then, the effectiveness of existing item-parcelling (random, correlation, and single-factor) and the proposed cluster-parcelling (IPCM) methods were determined based on the performance of parameter estimates and model fit for normal and non-normal data in SEM. The data were generated for nine different sample sizes (100, 150, 200, 250, 300, 500, 1000, 1500, and 2000) and three different data distributions (normal, moderately non-normal, and severely non-normal) for each simulation phase. Finally, the effect of proposed IPCM method on parameter estimates and model fit were examined for a real-dataset. The simulation results indicated that model fit improved with implementation of IP and 2I6P model have the least biased parameter estimates among the IP methods. Under normal and moderate non-normal distributions, across all sample sizes, the bias of parameter estimates is acceptable for all IP methods except correlation method. Meanwhile, the parameter estimates are less bias for random, single-factor, and IPCM methods for large sample sizes ( $n \geq 500$ ). Under severe non-normal distribution, the bias of parameter estimates is acceptable for random, single-factor and IPCM methods when sample sizes were 150 and above, while the parameter estimates are less bias for random and IPCM methods when sample size is very large ( $n \geq 1000$ ). Based on goodness-of-fit index (GFI), adjusted GFI (AGFI), and root mean square error of approximation (RMSEA), IPCM method produced the best model fit for IP models. Meanwhile, based on normed fit index (NFI), Tucker-Lewis index (TLI), and comparative fit index (CFI), the model fit is better for single and IPCM methods compared to others. The results indicated that the proposed IPCM method can be considered in application of IP in SEM since the parameter estimates for IPCM method is the closest to the IL model and the model fit based on GFI, AGFI, NFI, TLI, and CFI improved with implementation of IP.

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