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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Thesis submitted in fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Statistics)

Faculty of Computer and Mathematical Sciences

January 2022

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.

ACKNOWLEDGEMENT

In the Name of Allah, the All-Compassionate, All-Merciful

Alhamdulillah, praise to Allah S.W.T for giving me the strength and opportunity to embark on my PhD and for completing this long and challenging journey successfully. My utmost gratitute and thanks go to my main supervisor Professor Dr. Yap Bee Wah for her constant guidance, support and encouragement. Her kindness, meticulousness to details, brilliant ideas and her exemplary passion for research gave me the strength and inspired me to explore this field, which I have started with zero knowledge.

I would like to thank my co-supervisor, Assoc. Prof. Dr. Sayang Mohd Deni for her ideas, support and commitment. Thank you for assisting me with this research. Thank you to Dr. Norshahida Shaadan and Dr. Ahmad Nazim Aimran for their valuable advice and comments, and also to all my colleagues and friends for their never-ending support, advice and helping me with this research.

This thesis is dedicated to my very dear father and mother, Kamaruddin Saad and Ahsiah Ariffin, relatives especially Siti Salbi Saad and Salmiza Saad. Thank you very much for providing me the best education since the beginning and remain my inspiration throughout. Special thanks also to all my brothers and sister for their continuous support.

Finally, I owe thanks to a very special person, my husband, Mohammad Sabidi Shahidan for his continued and unfailing love, support and understanding during my pursuit of Ph.D degree that made the completion of thesis possible. You were always around at times I thought that it is impossible to continue, you helped me to keep things in perspective. I greatly value his contribution and deeply appreciate his belief in me. I appreciate the presence of our sweetheart, Muhammad Ammar Mohammad Sabidi during my Phd Journey. Words would never say how grateful I am to both of you. I consider myself the luckiest in the world to have such a lovely and caring family, standing beside me with their love and unconditional support. Alhamdulillah.

I thank you all with doa, Jazaka-allahu Kayran (May Allah bless you with goodness).

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