Article Review

MacCallum, Robert C. and Austin, Jame T. (2000). "Applications of Structural Equation Modeling in Psychological Research", Annu.Rev.Psychol. 51: 201-226.

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I

Structural Equation Modeling (SEM) represents an extention of general linear modeling (GLM) procedures that include analysis of variance (ANOVA) and multiple regression analysis (MRA). The primary advantage of SEM is that it can be used to look into the relationships among latent variables that are indicated by multiple observable variables. SEM also deals with a confirmatory factor analysis or hypothesis testing approach in which Latent Variables (LVs) are verified against Measured Variables (MVs) as well as causal pattern among LVs.

SEM is applicable to both experimental and non-experimental research, as well as cross-sectional and longitudinal data. With the development of software for statistical analysis in the social sciences, e. g, LISREL and AMOS, applications of SEM have proceeded rapidly since the 1970s. And yet the ease of access and application of such a complex and sophisticated techniques has given rise to a number of problems and chronic misuses and oversights in practice.

II

In their article: "Applications of Structural Equation Modeling", MacCallum and Austin began with an overview of SEM then proceeded to literature review on previous reviews of applications and current review. The authors summarized uses of SEM in psychological research i.e., cross sectional and longitudinal designs and measurement studies, and experimental studies.

The authors outlined various problematic issues in applications of SEM which were of global concerns and problems involving details of analysis, interpretation, and presentation of results. As far as generalizability of findings was concerned, it seemed to the

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authors that much of the applied SEM reviewed was characterized by inadequate understanding or acknowledgment of the limitations of single studies. In more specific terms, results were usually interpreted as it substantial generalizability could be made. Researchers using SEM did not, in most cases, recognize that the results were subject to sampling or selection effects with respect to at least three aspects of a study: individuals, measures, and occasions.

Confirmatory bias was another problematic issue in the application of SEM. The researchers using SEM were quite susceptible to have prejudice in favour of the model being evaluated in that there were overly positive evaluation of model fit and a routine reluctance to considered alternative explanation of data.

Moreover, reviews by the authors showed that directional effects, or causal relationships, were routinely studies using cross-sectional designs. The issue of concern here by the authors was the time lag between a couse and an effect. Thus, it might be problematic to infer causality of directional influence in cross-sectional studies.

Furthermore, the authors were concerned about the issues on model specification, design and analysis. A full LV model specifies relationships of the indicators to the LVs as well as relationships of the LVs to each other. However, 25% of the studies reviewed used path analysis model, with no LVs. i.e., only one indicator for each variable. This approach could result in estimates of effects that were highly biased due to the influence of error. Regarding research design, about 18% of the studies reviewed used samples of fewer than 100 individuals. The authors argued that SEM analyses of small samples were almost certainly problematic. Model specification and evaluation by means of confirmatory and model generation strategies were highly restrictive, potentially misleading and easily abused. Therefore, such data-driven model modifications might lack validity. About 50% of the published applications fitted models to correlation matrices rather than covariance matrices which were preferable. As far as interpretation of results was concerned, researchers did not seem adequately sensitive to the fundamental reality that there was no true model.

Finally, the authors encountered many difficulties associated with presentation of information about models, methods, analysis and results. For example, in about 50% reporting of parameter estimates was incomplete in that there was omission of non-significant estimates, unique variance, and/ or residual variances, and criteria

for evaluating values of fit indexes were not clearly stated.

III

In their article titled “Applications of Structural Equation Modeling in Psychological Research” MacCallum and Austin, both of whom were attached to Department of Psychology at Ohio University, have outlined the variety of research designs and substantive issues to which SEM can be applied productively. Readers of this article can certainly benefit from their presentation as an overview on what the SEM is and what it can be used for in research in not only psychology but also in other fields in the social sciences.

As a matter of fact, the more useful part of the article is on problematic issues in applications of SEM. As mentioned above, the problematic issues raised by the authors are worthwhile for researchers who are contemplating application of SEM in their research so that they are aware of them.

The most useful part of the article is the part that provides suggestions or solutions to the problematic issues in the applications of SEM. It is also a must for researchers who contemplating application of SEM in their research to follow as closely as possible. Failure to do so would lead to a quantitative research that is poor in quality.

IV

SEM is a highly versatile statistical technique that can be applied in research in social sciences. And yet there are problematic aspects of applications of SEM. These range from problems of perspective, design and strategy to mechanical aspects of model specification, data analysis, interpretation, and presentation as outlined by MacCallum and Austin in their article mentioned above. It is fortunate that they also have suggested ways and means to tackle those shortcomings to a large extent. Therefore, it is advisable that researchers who want to apply SEM in their research are aware of the problems and follow the suggestions to avoid them so that SEM is applied productively.

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