Chapter 10
An Overview of Structural Equation Modeling and Its Application in Social Sciences Research

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ABSTRACT

Social science research deals with the highly complex phenomenon guided by various latent and interrelated constructs. As these constructs are invisible and not directly measurable, social scientists employ highly sophisticated multivariate analytical techniques that can simplify a complex data pattern to derive meaningful conclusions. Structural equation modeling (SEM) is a methodology used to represent, estimate, and test a network of relationships among variables. It is an integrated model for hypothesis testing and constructs' validity. This chapter deals with the various aspects of the SEM methodology, starting from describing the statistical algorithms used, the role of theory, measurement and structural model, stages in testing model validity, etc., meticulously explained in simple terms to provide with a basic understanding of this intricate technique.

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INTRODUCTION

Structural equation modeling (SEM) is considered as a broad statistical approach for testing hypotheses of relations among and between both kinds of variables, observed and latent (Hoyle, 1995). It is a family of statistical techniques permitting researchers to test complex research questions of multivariate models. The goal of SEM and factor analysis is alike; that is, to provide a brief summary of all possible interrelationships between latent psychological variables (Kahn, 2006). Path analysis and SEM are similar in that each permits testing hypothesized relationships between constructs. This way SEM can be regarded as a hybrid of factor analysis and path analysis. Like in multiple regression models, where researchers freely conduct several combinations to find a suitable model, SEM also identifies and removes weaknesses in the model and refines to present a model similar to one originally hypothesized. Hence, it can be regarded as integrated model for hypothesis testing and constructs' validity. SEM analysis goal is to determine the range whether obtained sample data support the hypothesized theoretical model. If data supports more complex models may be hypothesized; if not supported original model is to be modified, or other theoretical models need to be developed. In doing so, SEM can help us assess the measurement properties and test the proposed theoretical relationships specified by using a single technique. Compared with other general linear models, where constructs may be represented with only one measure and measurement error is not modeled. Still, SEM involves complex, multi-faceted constructs that are measured with error i.e., the use of multiple measures to represent constructs and address the issue of measure-specific error. Here advantage of SEM is its ability to incorporate both quantitative and qualitative data (in coded form) for analysis. This framework is an integration that combines Measurement Theory from Psychology, Factor analysis from Psychology and statistics, Path analysis from biology (epidemiology), Regression modeling from statistics and Simultaneous equations from Econometrics. Therefore in existing literature SEMs are also known as Covariance structure analysis, Analysis of Moment Structures (AMOS), Analysis of Linear Structural Relationships (LISREL), and Causal modelling.

BACKGROUND

SEM is an old statistical technique that has undergone progress over years, yet is not completely explored by researchers. The history of this technique started with the work of Spearman (1904) by introducing factor analysis method which forms basis for measurement of latent variables. Later with Wright (1918) path analysis approach of correlations were applied to determine relationships between parameters