

Composite Measures in Sport Management Research

Claudio M. Rocha, The Ohio State University

Packianathan Chelladurai (Advisor), The Ohio State University

**Research/statistical methodology
Abstract 2009-255**

**May 30, 2009
4:30 PM**

**25 minute oral
(Congree A/B)**

Scholars in sport management have increasingly resorted to the employment of structural equation modeling (SEM) as the data analytic technique in their research involving complex models with interrelated theoretical constructs. For example, we found at least one article per issue in the last four issues of the *Journal of Sport Management* that used SEM in analyzing the data. SEM permits the building, testing, and confirming of models of multivariate relationships. One advantage of SEM over traditional multivariate statistical methods is that SEM can evaluate the fit of both a measurement model and a structural model (Tabachnick & Fidell, 2007).

The analysis of the measurement model seems to be particularly critical in our area. As sport management scholars increasingly tend to test complex models (e.g., Trail, Fink, & Anderson, 2003) and as they employ multiple items to indicate each of the constructs in the model there arises the problem of sample size. According to Landis, Beal, and Tesluk (2000), "including all items as individual indicators in a full SEM analysis requires a substantially larger sample size as the number of indicators increases" (p. 187). In this sense, measurement models with a large number of parameters and a small sample size tend to produce poor fit indexes, mainly because measures of factors tend to show greater measurement error (Bagozzi & Edwards, 1998). Landis et al (2000) highlighted that sample sizes presented in organizational studies have frequently failed to obtain stable parameter estimates. In our context, due to small response rates, the sample size is usually, at most, moderate (Turner, Jordan, & Sagas, 2006). To obtain a more precise assessment of structural relationships in measurement models, researchers have opted for reducing the number of parameter estimates by collapsing the items of a given scale into multi-item composites. Different methods for forming multi-item composites have been used in the literature (Brooke, Russell, & Price, 1988; Cramer, 1996; Williams & Anderson, 1994). Landis et al (2000) noted six methods as potentially useful-(1) in the random method, items are randomly assigned to composites; (2) in the content method, items are assigned to the composites based on a theoretical analysis of the content of these items; (3) in the single-factor method, all items of a given scale are examined through a factor analysis where a single-factor solution is set and the item with the highest loading is paired with the item with the lowest and so on until all items have been assigned to composites; (4) in the correlational method, the correlations among items are examined and the items with the highest correlation are paired and assigned to the first composite, items with the second highest correlation are assigned to the second composite, and so on until all items have been assigned; (5) in the exploratory factor analysis method, the number of composites and the items per composite are defined after running an explanatory factor analysis for a given scale; and (6) in the empirically equivalent method, items with similar means, standard deviations, and reliabilities are assigned to the composites.

Our main objective was to test and identify the methods that yield better-fit measures for a measurement model when sport management data are considered. To do so, we used data collected from 267 NCAA Division I coaches. These data were originally collected for a study whose purpose was to test the mediational role of organizational commitment (OC), organizational citizenship behavior (OCB), and perceived organizational support (POS), to explain intercollegiate coaches' performance. Our measurement model included six variables and 91 parameter estimates. Due to this large number of parameter estimates and the moderate sample size, our study seems to offer a perfect opportunity to test the effects of various methods of forming composites on the measurement model fit indexes. With our original model with six variables and 91 parameters (i.e., a total disaggregation strategy), the fit indexes were poor (NFI = .810; IFI = .871; CFI = .870; RMSEA = .081; and $\chi^2/df = 2.740$). Using composites to test our measurement model (partial disaggregation model), we reduced our parameter estimates to 39. The two most efficient methods to improve model fit in our data were the random method (NFI = .975; IFI = .988; CFI = .988; RMSEA = .059; and $\chi^2/df = 1.918$) and the content method (NFI = .974; IFI = .987; CFI = .987; RMSEA = .060; and $\chi^2/df = 1.969$). The so-called "empirical" approaches to form composites (methods 3 to 6) contributed to improvements in NFI, IFI, and CFI indexes but not in RMSEA and χ^2/df . Based on these results, we suggest that the use of composites should be considered as a strategy to test measurement models in sport management investigations where moderate sample sizes are available. We agree with Landis et al. (2000) that the random method seems to be "the most appealing alternative," because it does not require any previous analysis (empirical or not) to construct the composites.