

Construct Measurement and Model Specification in Sport Management Research: A Philosophical and Methodological Discussion on Reflective and Formative Structures

James Du, Temple University

Mikihiko Sato, Temple University

Daniel Funk, Temple University

Jeremy Jordan, Temple University

Jeffrey James, Florida State University

James J. Zhang, The University of Georgia

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Nomological networks are essential to understand phenomena in social science research. Latent constructs and structural equation modeling (SEM) have been extensively utilized to advance our knowledge of these networks. With the proliferation of SEM methods, robust check of model configuration, testing procedure, and path estimation cannot be understated. A review of the Journal of Sport Management (JSM) over the last decade revealed that 38.5% of research published in the journal may suffer from potential model misspecification, which could result in misleading conclusions and biased findings (Jarvis, MacKenzie, & Podsakoff, 2003; Petter, Straub, & Rai, 2007). Hence, this symposium is proposed to provide philosophical and methodological perspectives on two distinct measurement structures of latent constructs and potential consequences of model misspecification in sport management research. The use of appropriate rational and techniques to guide model identification and specification is also addressed. An interactive and informative discussion will synthesize diverse points and provide new insights on empirical investigations within the discipline of sport management. The symposium is divided into four sub-sessions.

Session 1: Conceptual Distinction between Reflective and Formative Structures

Churchill (1979) criticized that previous research in social science primarily focused on the nomological network among constructs, but bestowed less consideration on the relationship between measures and the associated latent variables. The latter emphasizes a need to justify a variety of construct validity and reliability issues. The advances of SEM bridge this gap. SEM draws a distinction between the measurement model and the structural model and provides a simultaneous assessment of hypothesized causal paths and measurement items, which is essential to warrant construct validity and reliability (Bagozzi, 2011). However, similar with other social science disciplines, a review of JSM articles reveals that measurement issues have been justified based on classical test theory. It makes the assumptions about the relationships and directionality among a construct, its indicators, and their respective error terms (Bollen, 2011).

Extending early work on the conceptualization of causality between the constructs and their measures in mainstream management literature (Bagozzi, 1981; Fornell & Bookstein, 1982), Bollen and Lennox (1991) differentiated two types of measurement models by stating that a construct could be measured reflectively or formatively. A reflective construct has observed measures that are influenced by an unobservable latent construct (MacCallum & Browne, 1993). That is, a change in the construct affects the underlying reflective measures. In contrast, a formative construct is a composite estimate of multiple measures (MacCallum & Browne, 1993). Unlike reflective measures, change in the formative measures cause changes in the underlying latent construct (Jarvis et al., 2003). A construct is not inherently reflective or formative. Rather, the structure of construct is contingent upon a prerequisite conceptual rationalization and empirical testing of statistical properties of associated measurement items (MacKenzie, Podsakoff, & Podsakoff, 2011).

Session 2: Identification of Reflective and Formative Structures

Reflective and formative structures are different based upon conceptual, operational, and interpretative perspectives. Following Petter et al.'s (2007) recommendations, four decision rules are applied to distinguish reflective and formative measures under multidimensional constructs in sport management research and three published papers will be used to highlight these rules applied to sport involvement (Beaton, Funk, Ridinger, & Jordan, 2011) and event

satisfaction (Tsuji, Bennett, & Zhang, 2007; Yoshida & James, 2010). First, directionality of causality: This regards whether variations of latent constructs cause changes in associated measures or vice versa. In a reflective structure, changes of latent constructs cause changes in the measurement items as they are a linear function of the construct. In a formative structure, however, changes in formative indicators do not necessarily cause changes in other indicators but the respective latent constructs as the latent variables are represented as a linear equation of the indicators.

Second, interchangeability of the indicators and lower-order constructs: This criterion refers to the substitutability of measurement items for a latent constructs. Reflective items, by definition, should consist of a unidimensional structure and represents a common theme. In contrast, removal of a specific indicator for a formative item would affect the meaning of the construct as the formative construct loses a facet that is supposed to formulate the concept. Third, the covariance structure among the indicators as well as the lower-order latent constructs: Measures of reflective constructs are required to highly covary with one another since reliability is critical to justify whether they are representing the same variable that they are supposed to measure. Therefore, when construct validity and reliability become a focal interest of research, a reflective model is preferred. In contrast, a formative model should be considered when predictability of a proposed model is a concern. Fourth, the nomological network of the construct measures: The criterion examines if measures of a construct have the same set of antecedents and consequences. In a reflective structure, the measures share the same cause of the associated latent variables since they are function or manifestation of the construct. Conversely, a formative construct is a composite of the indicators, however, it is not necessary for them to have the same antecedents. It is noted that the four criteria are necessary but not sufficient to identify a correct measurement structure since they are not mutually exclusive.

Section 3: Consequences of Model Misspecification with Empirical Illustrations

Conceptual oversight and ambiguity may increase the likelihood of false positive rate to specify a model in SEM. Jarvis et al (2003) supported that type I error of model misspecification is more pervasive in consumer and organizational research, where a construct should have been configured in a formative structure but in fact an operationalization in a reflective manner has been adopted. Using Monte Carlo data simulation procedure to replicate data structure from published articles in the Journal of Sport Management over the last decade, this symposium will illustrate that model misspecification has a significant impact on subsequent estimation of structural models. Our results revealed two types of biases are likely to occur: First, if exogenous variables were misspecified, inflated estimates of path coefficients in a structural model were observed while path coefficients of misspecified endogenous variables were suppressed. Specifically, if a type I error appears, results tended to either overfactor the number of indicators in the measurement model or overestimate the associated path coefficients in the structural model, where the measurement should have been configured as a formative structure. Second, swamping effects were salient in a situation where endogenous variables consist of a formative structure, in which all the variances of included endogenous variables will be statistically absorbed by its indicators. Also, path coefficients of antecedent exogenous variables were severely underestimated. Moreover, these path coefficients would be statistically susceptible to the number of items that a reflective endogenous variable retains when the associated exogenous variable contains a formative structure.

Session 4: Future Practices

The final session is proposed to elicit discussions on incorporating formative structure and associated methodological toolkit into sport management research. We conclude with recommendations for managing formative and reflective structures for sport management moving forward. First, prior to data collection, researchers are encouraged to consider different types of measures and the nature of multidimensional constructs into the research design. Second, in analyzing the data containing formative structures, we suggest that partial least square-structural equation modeling (PLS-SEM) can be an effective tool. Third, given that a causal indicator model in isolation is statistically under-identified in covariance-based-structural equation modeling (CB-SEM), researchers can also administer a technique such as Multiple Indicators Multiple Causes (MIMIC) model to test the model that includes both formative and reflective structures. Fourth, regardless of whether researchers utilize CB-SEM or PLS-SEM, clarification of the goals and nature of the research in conjunction with justification for the selected analysis technique should be articulated. Finally, whatever SEM toolkit is deployed, identifying sample characteristics, additional structural model evaluation criteria, and algorithmic procedure is recommended to improve quality of publications in sport management.