



## Research Article

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# Specifying the Problem of Measurement Models Misspecification in Management Sciences Literature

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## Abstract

*Perhaps the most serious problem of measurement models misspecification is that it will lead to type 1 and type two errors. Consequently, these errors forbid researchers from adequately theory testing and meaningfully theory development. Therefore, the aim of this methodological review is to explore the leading cause(s) of measurement models misspecification in management sciences literature. Based on literature and arduous lessons learned from mistakes and author experience, it was found that researchers and students provides generic statements on research instruments in their research articles, theses and dissertations, but these statements are not sufficient enough for proper measurement models specification in different contexts. Meaning that little attention has been paid in literature to the conceptual and theoretical clarity of the focal construct which adequately covers the content domain the construct capture. Thus, the author of the paper argue that neglecting conceptual and theoretical clarity on the nature of construct with in the rubric of measurement theory at both abstract and empirical levels are the major causes of measurement model misspecification. Therefore, it is recommended that scholars need to provide conceptual and theoretical clarity on the content domain construct capture in their research. Journal editors and potential reviewers also need to look for this on priority. Since, the quality of research hinges on how clearly constructs are conceptualize and how well others understand these constructs.*

**Keywords:** formative measurement model, reflective measurement model, measurement models misspecification, higher order factor, SEM-PLS

## 1. Background of the Study

Many authors including myself agreed-upon that the process of scale development begins with the conceptual specification of the domain of construct i.e., preliminary conceptual definition; what it is, and what it is not; the agreed-upon meaning; the purpose of the domain; the content the domain capture, specification of dimensions if any; definition of dimensions; identifying level of construct-specific vs broad etc. (Hair et al., 2019; Boateng et al., 2018; Dwivedi & Weerawardena, 2018; Tay & Jebb 2017; Gamst et al., 2015; Churchill, 1979) . Despite emphasis on this; unfortunately, the literature on conceptual specification of construct and its measurement is inconsistent e.g., in a recent study “conceptualizing and operationalizing the social entrepreneurship construct”, Dwivedi and Weerawardena (2018) conceptualizes social entrepreneurship construct as a reflective-reflective higher-order construct, whereas the same has been conceptualized as a first order reflective measurement model by Mumtaz et al. (2021). Likewise, two different styles of leadership-transactional and transformational has conceptualizes by Thien et al. (2019) as a 3<sup>rd</sup> order higher leadership construct. The same has been conceptualizes differently in other studies e.g., transformational leadership was measured with eight reflective items by Akdere and Egan (2020), 20 items-reflective-formative by Minhaj et al. (2019), 15 items, reflective-reflective by Shirekhodajouybari (2016), four reflective items (one was removed due to measurement error) by García-Morales et al. (2012), five statements index by Chau et al. (2021), Campbell (2018) and Wright et al. (2012) and seven reflective items by Buil et al. (2019), among others.

The conceptual definition of transformational leadership in the above mentioned studies were found to be same at abstract level. But no general agreement were found on the nature of relationship within the domain construct, meaning that at empirical level the content domain transformational leadership capture was measured differently, even no conceptual justification were found under the rubric of well develop measurement theory. Yes, a generic guidelines have provided in these studies that the measures have been adopted or in some studies adapted from literature but little attention has been paid to conceptual justification which adequately covers the content domain the transformational leadership capture. By the same token, reviewing three years complete volumes of MIS quarterly Petter et al. (2007) found misspecification problem in MIS literature whereas in their critical review Jarvis et al. (2003) found misspecification problem in marketing and consumer research. Equally, Nimako and Ntim (2013) found that about 67% of construct misspecification problem exists in theory of consumer switching behavior.

From Human Resource perspective, divergent specification of organizational commitment construct has been found in human resource literature. For example. as per research context Kayani and Kayani (2021, p. 16) used 10 indicators to measure organizational commitment construct, however, no information has provided on the

relationship between items and organizational commitment construct nor have they provided information on organizational commitment multidimensionality. Ramalho Luz et al. (2018, p. 90) adopted 18 items to approaches three aspects of organizational commitment i.e., normative commitment, instrumental/continuance commitment, and affective commitment. In other studies (e.g., Waheed et al., 2017; Shahbaz & Hadi, 2021; Latif et al., 2021; Yousaf & Hadi, 2020; Tahir et al., 2021) specific aspect of organizational commitment-affective commitment has been approached.

It is noticeable from the above discussion that different authors have specified measurement models in variety of ways in management sciences literature. This raised a question that need to be enquired, does specifying measurement models in variety of ways lead to error(s)? Perhaps the most serious problem of measurement model misspecification is that it will lead to type 1 and type two errors (i.e., the hypothesized relationship between indicators and construct is actually formative, but it is rejected, a type II error occurs when the formative constructs are measured as reflective constructs). Consequently, this prohibits researchers from appropriately theory testing and meaningfully theory development (Edward & Bagozzi, 2000 and Petter et al., 2007, p. 625). Therefore, the aim of this methodological review is to explore the leading cause(s) of measurement models misspecification in management sciences literature. The study fully support previous findings and contribute additional evidence that may help in proper measurement models specification.

The rest of the paper is organized as follows: the next section outlines construct conceptual specification. This is then followed by specification of formative and reflective measurement models. The paper further provides example on hotel satisfaction construct from both formative and reflective measurement perspectives with explicit explanation. The paper further provide guidelines with example on how to specify higher order construct (organizational commitment in this study). The paper then concludes with recommendation to scholars, journal editors and potential reviewers.

## **2. Construct Conceptual Specification**

Construct conceptual specification is the process of specifying explicitly what exactly researcher mean when he/she uses a particular term in his/her research. Researchers may focus on two things at construct conceptual specification phase (Bisbe et al., 2007). 1) Define the content domain of construct-what is and what is not included in the domain of construct then specify the dimensions (if any), define the dimensions and delineates the conceptual boundaries of what the construct comprises and what it addresses. 2) identification of the direction of the relationship i.e., the linkages of indicators with constructs or indicators with dimensions then construct, depending on the level of construct identified in first step. With this, researchers also need to provide conceptual clarity / valid justification on why they belief the nature and direction of

relationship between first order reflective measurement model or first order formative measurement model exist. In case of higher order construct, the nomological net need more clarity as four types of different measurement models are formed; formative-formative measurement model, formative reflective measurement model, reflective formative measurement model and reflective-reflective measurement model (Sarstedt et al., 2019). Conceptual clarity under the rubric of measurement theory is critical as the success of research hinges on how clearly concept is conceptualize and how well readers understand the meaning of construct at empirical levels.

### *2.1 Specification of Formative and Reflective Measurement Models*

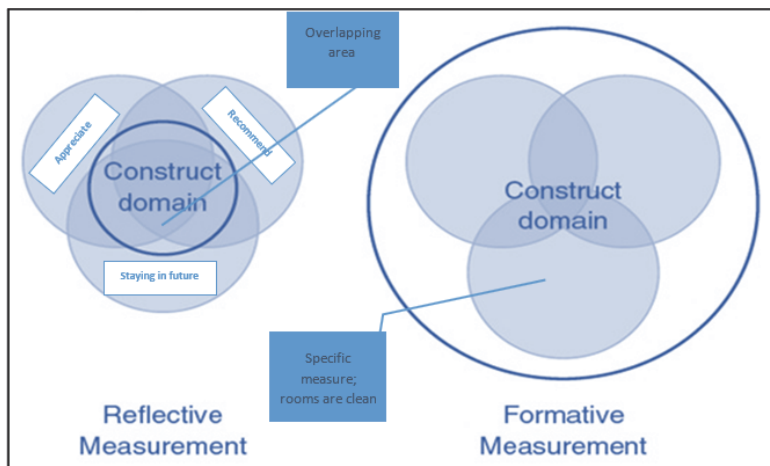
The nature and direction of relationship between indicator(s), dimensions and construct are not inherently defined, however, the measurement theory specifies how the latent constructs are measured (Hair et al. 2014; MacKenzie et al., 2011). To measure latent constructs in SEM there are two different ways i.e., reflective measurement theory and formative measurement theory. In reflective measurement theory measures are caused by the construct (they stem from the same construct domain thereby they are highly correlated and can be used interchangeably) whereas in formative measurement theory measures cause the construct domain (each measure capture different aspects of the construct domain thereby omitting a single measure change the meaning of construct). Thus, conceptualizing the content of construct by paying particular attention to the nature and direction of relationships within the domain of construct is important as a sound parent theory is important for hypotheses development under deductive approach. Thus, it is postulated that theoretical clarity at both abstract and empirical levels on the content domain the construct capture will usefully supplement the scale development and scale validation process.

#### *2.1.1 Example on formative and reflective measures*

As mentioned earlier that in reflective measurement model measures are caused by the construct (see Figure 2), the three measures of hotel satisfaction (i.e., “*I appreciate this hotel*”; “*I am looking forward to staying in this hotel*” and “*I recommend this hotel to others*”) are related to each other and can be used interchangeably. For example, I appreciate this hotel so I am looking forward to stay in this hotel in future and I will also talk much about this hotel and would recommend this to others in my circle. If we see, all these three items capture the same domain of satisfaction with hotel thereby the relationship within the domain of construct is overlapped (see Figure 1) and that’s why they are correlated. In contrast, the formative measures take in to account different aspects of hotel satisfaction (i.e., “*the service is good*”; “*the personnel is friendly*”; “*the rooms are cleans*”) in this example the three facets are not related to each other and cannot be used interchangeably. For example, clean room doesn’t assure that the

personnel are friendly and friendly staff doesn't assure that the services will be good. I may satisfy from the room cleanness but I may not satisfy from hotel staff friendliness, all these measures are not related to each other but yes, measure different aspects of hotel satisfaction. In this example, changes in any formative measure cause changes in the hotel satisfaction as each measure captures different aspects of hotel satisfaction and omitting any facet of hotel satisfaction will affect the content domain the hotel satisfaction intended to capture.

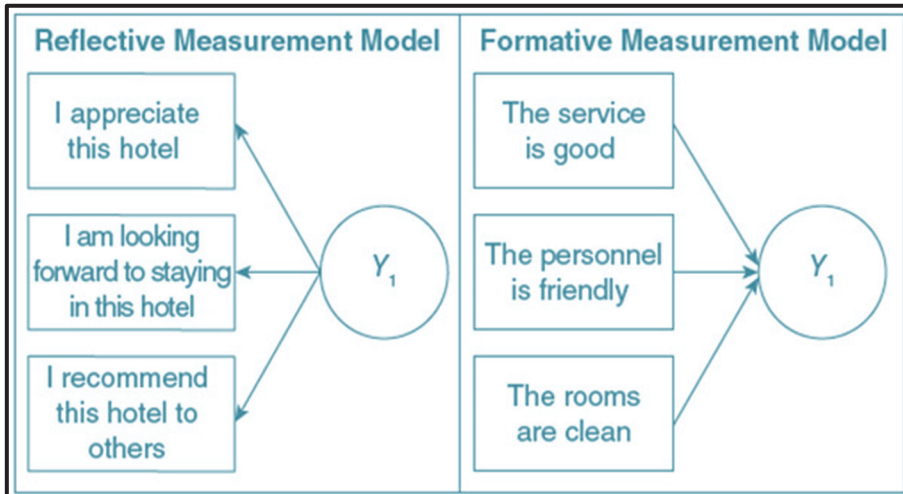
From the above example it is much clear that if the measures capture the same domain (overlapping measures-see Figure 1) they are correlated and can be used interchangeably, in this situation specify reflective measurement model (see Figure 2 left side) with explanation for readers. If the measures capture specific aspect of construct domain specify formative measurement model (see Figure 2 right side) with explanation. As mentioned earlier, this explanation is mandatory as a sound theoretical background/parental paradigm/theoretical underpinning is important for hypotheses development under deductive approach.



**Figure 1:** Domain of construct-hotel satisfaction capture

**Source:** Hair et al. (2014, 44)

Regarding statistical evaluation, the assessment criteria for reflective measurement models are different than formative measurement models, e.g., for reflective measurement model result of AVE is assess to ensure convergent validity whereas for formative measurement model, result of redundancy analysis is assess to ensure convergent validity (Hair et al., 2014) using PLS-SEM. Even, the nature of analysis in doing exploratory factor analysis (factor rotation) is also different (Direct Oblimin vs Varimax rotation) Hadi et al. (2016a) in SPSS.



**Figure 2:** Formative and reflective model specification  
**Source:** cited by Hair et al, (2014), OS: Albers (2010)

### 2.1.2 Example 2; Specifying Higher Order Construct (Organizational Commitment)

As mentioned earlier that organizational commitment (OC) has been measured in variety of ways, let see how to specify it. Organizational commitment is the degree to which an employee wishes to remains retained in their current organization. This theory-based definition of organizational commitment is 3-component model (Meyer & Allen 1991; Abdullah, 2011), meaning that organizational commitment has three distinct but related aspects and each aspect represents some portion of the overall organizational commitment. First, employee may wishes to maintain membership with their current organization due to Fear of Lose (Continuance aspect of organizational commitment). Continuance organizational commitment occurs when employee feel that leaving the organization will require a considerable personal sacrifices, for instance, quitting the job may lead to lose of status or quitting the job may lead to an unacceptable length of unemployment. In continuance commitment employee retention is determine by Fear of Loss. The second aspect of organizational commitment occurs when employee feel a Sense of Obligation-normative organizational commitment. Employee wishes to stay in organization because s/he feel it is the right thing to do. Number of factors determine normative organizational commitment for example, organization may provide reward(s) in advance, organization may paid children tuition fee in advance or may provided extensive trainings etc. The third form of organizational commitment is Affective commitment (AC), affective organizational commitment is employee psychological or emotional attachment to his/her organization. In this from of organizational commitment, employee wishes to remains

retained because s/he love her/his organization. These three dimensions (Continuance, Normative, and Affective) are not driven by organizational commitment construct rather the three separate facets are necessary to fully capture the entire domain of OC construct thereby a formative relationship can be modelled between each dimension and OC construct. It is noticeable that omitting any facet of organization commitment will lead to misspecification.

Further, the relationship between organizational commitment dimensions (as a second order factors) and its items may be modelled formative or reflective (apply guidelines discussed in example 1). If the measures cause the 2<sup>nd</sup> order construct domain (e.g., affective organizational commitment) the relationship between items and affective organizational commitment will be formative whereas if the items stem from the same domain the relationship between items and affective organizational commitment will be modelled reflective. Let discuss the six measures of affective organizational commitment;

*"I would be very happy to spend the rest of my career in this organization", "I really feel as if this organization problems are my own", "I feel like part of my family at this organization", "I feel I am emotionally attached to this organization", "This organization has great deal of personal meaning for me", and "I feel a strong sense of belonging to this organization".*

The six measures of affective organizational commitment stem from the same domain and represent the entire domain of affective organizational commitment. These measures are closely related and can be used interchangeably. For example, I am emotionally attached to this organization so I feel like part of my family at this organization, I feel strong sense of belongingness and I would spend the rest of career in this organization etc. All these items capture the same domain of Affective organizational commitment construct. The same is case for Normative and Continuance organizational commitment (see for detail appendix A, Figure 3).

### 3. Conclusion

Conceptualizing the content of construct by paying attention to the nature and direction of relationships within the domain of construct is critical. However, the domain of construct must be justified in well-developed measurement theory (in case of deduction) or logical reasoning and expert judges (in case of induction) as "constructs are not inherently reflective or formative but specification is based on construct conceptualization and purpose of the study" (Hair et al., 2014, p 45). Conceptual clarity and justification on the domain of construct not only help in determining the direction of relationship between indicators, dimensions and construct(s) but also assist in determining relevant analysis and assessment criteria for validity and reliability. In this paper I argue that neglecting theoretical clarity at both abstract and empirical levels on the nature of construct (the content domain construct capture) with in the rubric of measurement theory are the major causes of measurement models misspecification.

Thus, mentioning the adoption or adaption of research instruments in research articles, theses, and dissertations are not sufficient enough for proper measurement models specification. It is therefore, suggested that scholars need to consider two things for proper measurement models specification, first conceptual clarity on the entire domain of construct and second, how well the items or sub-constructs (if any) represent the overall domain of construct. Conceptual clarity at abstract level will guide on the scope of construct or the content domain capture whereas conceptual clarity at empirical level will guide on the direction of relationship between items and construct (in case of formative or reflective measurement models) or between items, sub-constructs (first order factors) and construct (in case of higher order factor). Journal editors and potential reviewers also need to look for this on priority, since, specification errors forbids researchers from theory testing and meaningfully theory development.

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## Appendix A: Rate your level of Organizational Commitment

Overall Organizational Commitment Scale
<b>Affective organizational commitment</b>
AC1 "I would be very happy to spend the rest of my career in this organization".
AC2 "I really feel as if this organization problems are my own".
AC3 "I feel like part of my family at this organization".
AC4 "I feel I am emotionally attached to this organization".
AC5 "This organization has great deal of personal meaning for me".
AC6 "I feel a strong sense of belonging to this organization".
<b>Continuance organizational commitment</b>
CC1 "It would be very hard for me to leave my job at this organization right now even if I wanted to".
CC2 "Too much of my life would be disrupted if I leave my organization".
CC3 "Right now, staying with my job at this organization is a matter of necessity as much as desire".
CC4 "I believe I have too few options to consider leaving this organization".
CC5 "One of the few negative consequences of leaving my job at this organization would be scarcity of available alternatives elsewhere".
CC6 "One of the major reasons I continue to work for this organization is that leaving would require considerable personal sacrifice".
<b>Normative organizational commitment</b>
NC1 "I do not feel any obligation to remain with my organization" (R).
NC2 "Even if it were to my advantage, I do not feel it would be right to leave".
NC3 "I would feel guilty if I left this organization now".
NC4 "This organization deserves my loyalty".
NC5 "I would not leave my organization right now because of my sense of obligation to it".
NC6 "I owe a great deal to this organization".

Anchored by Strongly Disagree (1) to Strongly Agree (5).

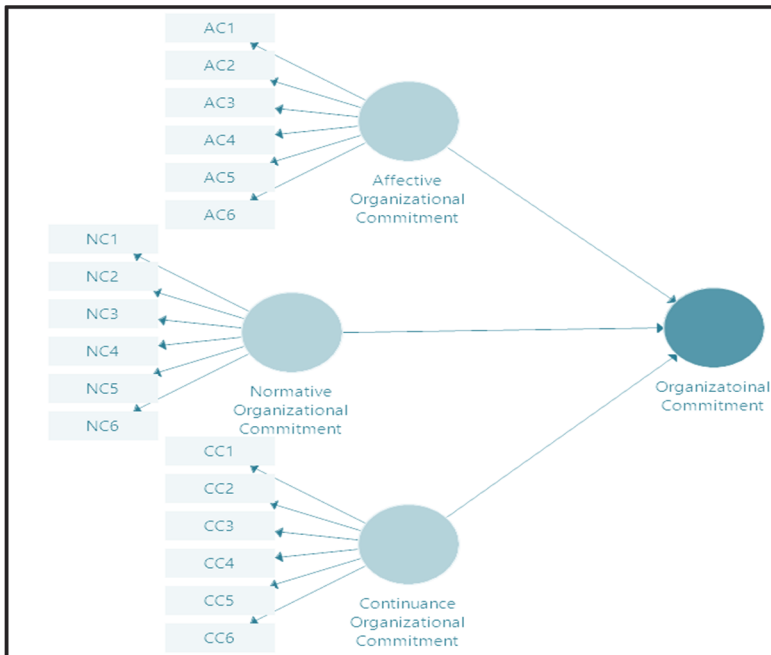


Figure 3: Organizational Commitment as a Reflective Formative Construct