Nomological Networks in IS Research

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Abstract

One major element to assess construct validity in positivism research is nomological validity, a concept that is still considered new in IS research. There exists very limited research on how nomological validity is manifested in IS research measurement, and how the existence of nomological validity is established. However, concrete procedures to establish criteria to make these judgments have not been well developed. The objective of this research is to investigate the issue of nomological validity in IS research based on a solid framework of construct validity, and to identify a superior means of establishing the nomological validity in the discipline. This is conducted by canvassing empirical studies published in eight IS journals and quantifying to what extent nomological validity has been established in past research. It is hoped that the findings of this research will provide IS researchers with better systematic and quantitative methods for ensuring consistent nomological validity.

Keywords

Construct validity, nomological validity, nomological network, measure.

Introduction

Nomological validity is still considered a new concept in organizational research generally and in IS research particularly, and it is one major element to assess the validity of a construct (Liu et al. 2012). Since the conception of nomological validity by Cronbach and Meehl (1955), both the conceptual structure and empirical application have gained only limited understanding and use in the information systems (IS) literature. There exists very limited research on how nomological validity is manifested in IS research measurement, and how the existence of nomological validity is established. The philosophical explanation of nomological validity never moved beyond its primitive explanation (Borsboom et al. 2004; Bornstein 2011). Consequently, there exist various misconceptions and misunderstandings about both the concept and how to apply it. While many recent research studies have endeavored to investigate the concept in various ways, little has been published about how this concept may be applied in IS research.

Cronbach and Meehl (1955) defined nomological network as “the interlocking system of laws which constitute a theory.” This implies the notion of a frequency with which a construct (concept) exhibits lawful relationships with other constructs. They viewed this condition as evidence that a construct has scientific validity by way of predictable, meaningful, and replicable relationships with other concepts (Miller et al., 2000). In practice, a nomological network includes a theoretical framework representing the theoretical constructs and their relationships, and an empirical framework demonstrating the measurements and their relationships, and the linkages between those two frameworks (Li and Larsen, 2011).

The debate on the association between validity and the nomological network has long been discussed in psychology and education literature (Emberston 1983, Borsboom et al. 2004; Slaney 2017). While some research has considered nomological validity to be an essential component of construct validity, it has been suggested that the former may also be related to content validity and criterion validity (Loevinger
1957; Messick 1989; Boudreau et al., 2001). However, others separate nomological validity from other validity tests (Bagozzi 1980; Calder et al. 1983; Straub et al., 2004; Salisbury et al., 2002)

**Problem Statement and Objectives**

A major issue in the positivist research is the construct identity, which has been a puzzle in the behavioral and social sciences for more than a century (Larsen and Bong, 2016). The construct identity fallacy, as they coined it, entails the discordant naming practices for a single construct, which results in referring to similar phenomena with identical names. This issue has also been specifically raised in IS research (Zmud et al. 1994; Larsen 2003)

The inability to validate the construct’s level of relatedness in behavioral theories will likely lead to the introduction of overlapping, identical redundant constructs that are improperly cited or used, causing a construct proliferation problem (Li and Larsen 2011). Thus, to ameliorate such a situation, building a consistent nomological network for construct interpretation is highly desirable and necessary.

Considering these challenges in the validation of constructs, concrete procedures to establish criteria to make these judgments have not been well developed (Liu et al., 2012). The field also lacks a coherent systematic analysis to engage in these practices. Masterson and Rainer (2009) stated two difficulties that the IS discipline faces: establishing the relationship between theory and research, and the development of theoretically defined constructs and measurement procedures. Therefore, the objective of this research is to investigate the issue of nomological validity in IS research, and to identify a superior means of establishing the nomological validity in the discipline. One approach might be by canvassing empirical studies published in eight IS journals and quantifying to what extent nomological validity has been established in past research. Therefore we generate two exploratory research questions: 1) How do IS researchers establish and ensure the nomological validity of their constructs? 2) What are the best practices to deploy better nomological validity assessment protocols? This study additionally seeks to offer recommendations on the use of construct validity in the IS research.

**Literature Review**

In IS research particularly, construct validation remains a central issue (MacKenzie et al. 2011). A survey conducted by Boudreau et al (2001) concluded that the majority of published studies in the discipline do not exhibit a sufficient validation of the instruments in use, echoing similar older claims (Bagozzi and Phillips 1982; Straub 1989) that still hold true today. Furthermore, MacKenzie et al. (2011) recognized that testing whether the measures of a construct relate to measures of other constructs in the research-specific nomological network is often misused by failing to rule out spurious causes as explanations for the findings. Moreover, indicators are often randomly sampled from a core set of possible indicators that represent the construct’s domain. Some of these indicators are closer to the core meaning of the centroid construct than others (Little et al. 1999). Therefore, information from the nomological network can be used to identify the best subset of indicators.

Methodologically, Byrne (1984) classified construct validation studies into three major categories, logical analyses, correlational techniques, and experimental techniques. Logical analyses deal with the theoretical refinement of the construct without empirical research. Correlational techniques typically involve factor analysis, multitrait-mutimethod matrix (MTMM) analysis, and regression analysis. Experimental techniques are found less in IS studies compared to the other precedent techniques. The control of common method was also highlighted to be observed when conducting statistical tests (Podsakoff et al. 2003; MacKenzie 2011).

In a recent study, Flake et al. (2017) introduces a state-of-the-art framework that categorizes various statistical evidence categorized in three phases: substantive phase, structural phase and external phase. The work of Flake et al. (2017) was based on seminal works of validation and measurement by Benson (1998), Crocker and Algina (2006), Loevinger (1957), Strauss and Smith (2009), and Raykov and Marcoulides (2011). It should be noted that The Standards of Educational and Psychological Testing (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (AERA, APA, & NCME 2014) actually serve as the official reference to this classification that outline best practices and methodology for conducting construct validation. The first
phase, the substantive phase, covers the theoretical foundations of a measure to define the construct, the scope and content validity according to the previous literature. The second phase, the structural phase, covers the quantitative analyses used to examine the psychometric properties of the measure. The final phase, the external phase, deals with investigating how the construct either relates to other constructs or predicts criteria in a larger nomological network. According to Flake et al., (2017), most research studies conducted were found to fail in the external phase. For a measure to be considered to be a consistent construct as determined previously in the literature, the measure should fulfill acceptable psychometric properties in current research. Namely, it is imperative to determine the substantive and structural evidence of validity before considering the findings that relate to the external phase or a replication study (Flake et al., 2017). While the first two components of validation in the framework are primarily concerned with producing test scores as measures of constructs that reflect common traits, the external validity component is primarily concerned with establishing the adequacy of the construct (Loevinger 1957; Messick 1995; Slaney 2017). Table 1 illustrates the construct validation framework:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Validity Evidence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substantive</td>
<td>• Literature review and construct conceptualization.</td>
<td>• Identifying depth and breadth of construct</td>
</tr>
<tr>
<td></td>
<td>• Item development and scaling selection.</td>
<td>• Expert review</td>
</tr>
<tr>
<td></td>
<td>• Content relevance and representativeness.</td>
<td>• Item mapping, focus groups, and cognitive interviewing, investigate construct under representation or irrelevancy (i.e., content validity)</td>
</tr>
<tr>
<td>Structural</td>
<td>• Item analysis</td>
<td>• Response distributions, item–total correlations, and difficulty.</td>
</tr>
<tr>
<td></td>
<td>• Factor analysis</td>
<td>• Exploratory and confirmatory analyses including structural equation models and item response theory</td>
</tr>
<tr>
<td></td>
<td>• Reliability</td>
<td>• Coefficients: $\alpha$ and $\omega$, inter-item correlations, test–retest, dependability.</td>
</tr>
<tr>
<td></td>
<td>• Measurement invariance testing</td>
<td>• Multiple group factor analysis, item response theory, and differential item functioning tests.</td>
</tr>
<tr>
<td>External</td>
<td>• Convergent and discriminant.</td>
<td>• Correlations between other scales meant to capture similar and different constructs, multitrait-multimethod matrix analyses</td>
</tr>
<tr>
<td></td>
<td>• Predictive/criterion.</td>
<td>• Regressions on criterion variables of import</td>
</tr>
<tr>
<td></td>
<td>• Known groups.</td>
<td>• Detecting differences between groups known to differ on construct</td>
</tr>
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**Table 1. Framework of Construct Validation phases**

**Methodology**

This research aims to review and meta-analyze how nomological validity is assessed in IS research. This will be accomplished by performing a literature search to identify empirical studies that assess nomological network when measuring an IS construct. The search will be limited to articles published between 2007 and 2017 in the eight journals of Senior Scholars Basket of Journals (AIS 2011), namely:
Nomological Networks in IS Research

European Journal of Information Systems, Information Systems Journal, Information Systems Research, Journal of AIS, Journal of Information Technology, Journal of MIS, Journal of Strategic Information Systems, MIS Quarterly. Two main criteria will be used to identify the selected research study sample. First, only articles that assess what they clearly term as “nomological network” or “nomological validity” will be selected. Second, articles that mention either terms or any of these terms but do not show any empirical assessment of the concept will be excluded. This is to ensure that only articles with empirical tests are included. Third, multiple articles investigating similar constructs by the same researchers will also be excluded if they are conducted in the same research setting. While the articles included in this research using this criteria may not represent all research in the IS field, it is expected that the concept of nomological network is best captured by the conglomerate term, although there are other research studies assessing the concept under other types of validity, which will be excluded from this research sample.

The articles will then be screened and the various definitions of nomological network/validity adopted identified and classified. The articles will also be classified again and coded according to the framework of Flake et al. (2017) to determine which category of the framework they belong to. Thus, this framework will serve as guidelines to determine how the concept of nomological network is approached. Such exploratory investigation of analyzing archival records seeks to generalize patterns and to map IS research publications into a validated framework that is widely used and accepted (Nolan and Wetherbe 1980; Masterson and Rainer 2009)

Expected Results and Contributions

This research aims to provide a systematic analysis to investigate the issue of nomological validity in IS research, based on a solid framework of construct validity. After the research is completed, it is expected that it will shed light on how nomological validity is used in the discipline. It is also hoped that the research will detect various issues in reporting this type of validity and recommend better practices in relation to the contemporary conceptual and empirical research. It is also hoped that the findings of this research will provide IS researchers with better systematic and quantitative methods for ensuring consistent nomological construct validity.

REFERENCES


