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Early-Stage Construct Development Practices in IS Research: A 2000-2020 Review

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Early-Stage Construct Development Practices in IS Research: A 2000-2020 Review

Short Paper

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Abstract

New constructs are routinely introduced and validated along with their measures to capture emerging IS phenomena. Although statistical validation procedures abound in the literature, there remains confusion on how to best engage with the first few steps of the construct development process. Consequently, authors may have difficulties navigating these crucial steps, and reviewers may be unsure what standards they should enforce. This short paper seeks to clarify the standards that are espoused and enacted by the IS community as part of its construct development activities. We selected 96 construct development focused papers published in IS journals between 2000 and 2020, and we systematically coded how their authors engaged with the conceptualization, item generation, and content validation steps. Our preliminary findings indicate that despite some apparent homogeneity, construct development papers employ widely divergent practices, some of which may not be adequate to address the most pressing methodological challenges of our time.

Keywords: construct development, conceptualization, content validity, construct proliferation, systematic review.

Introduction

Rigorous construct development practices are critical in the building of cumulative knowledge within the field of Information Systems (IS). It is a hallmark of vibrant scholarly communities that its members devote significant time and effort to creating and updating constructs that comprise its indigenous contributions to theory. Therefore, it is essential that IS researchers have a sound understanding and practice of the principles of construct development.

The construct development process, which involves the conceptualization of new constructs and the validation of corresponding measurement instruments, has been described as involving as series steps (DeVellis, 2017; Lewis et al., 2005; MacKenzie et al., 2011; Straub, 1989; Straub & Gefen, 2004). But despite extensive support in the development of high-quality constructs, there remains much confusion regarding how to implement Step 1 (conceptualization), Step 2 (item generation), and Step 3 (content validation) of MacKenzie et al.'s (2001) framework. Recognizing this issue, (Burton-Jones & Lee, 2017) argue that

"[positivist] researchers do not have good definitions of measures and measurement, nor do they have a clear agreement about how best to engage in or assess these activities" (p. 465).

The fuzziness that characterizes the first three steps of the construct development process is detrimental to individual IS researchers and to the IS research community. When researchers neglect the conceptualization and measure development stages, they "begin their data analysis journey with a losing hand" (Aguinis & Vandenberg, 2014) because poorly designed measures have a negative downstream influence on the overall validity of the measurement model. As such, it is now commonly held that researchers who invest additional time and effort at the front-end of the development process have a stronger impact (e.g., acceptance rates) than those who primarily employ psychometric analysis (Aguinis & Vandenberg, 2014; Burton-Jones & Lee, 2017; Gehlbach & Brinkworth, 2011). Further, there is growing concerns that a lack of rigor during these early stages will lead to the introduction of redundant measures (Bruner, 2003; Larsen & Bong, 2016; Newman et al., 2016; Shaffer et al., 2016). Though there are many guidelines discussing how to best engage with the conceptualization (e.g., Podsakoff et al., 2016), item generation (e.g., Miller et al., 2014), and content validation (e.g., Moore & Benbasat, 1991) steps, the extent to which positivist IS researchers acknowledge and adhere to these principles is unclear. Therefore, our objective in this article is twofold: 1) clarify what practices are expected during the conceptualization and measurement stages of the construct development process; 2) assess the extent to which IS researchers adhere to these practices.

Our desire to provide clarification is motivated by two trends. First, the expectation of what constitutes high-quality constructs has shifted over the years to place a stronger emphasis on the front-end of the construct development process (Aguinis & Vandenberg, 2014; Burton-Jones & Lee, 2017; Gehlbach & Brinkworth, 2011; MacKenzie, 2003). In fact, MacKenzie et al. (2011) were explicit in calling for such a shift in focus: *"*we recommend focusing more attention on the front-end of the process—on providing a clear conceptual definition and developing indicators that adequately tap the construct domain and properly specifying the measurement model—than on cross-validating the scale and developing norms for it*"* (p. 329). Second, the content validation techniques that provide empirical evidence of a new measure's correspondence to the focal construct have undergone substantial refinement and benefited from the introduction of novel assessment techniques (Colquitt et al., 2019; N. P. Podsakoff et al., 2012). Keeping track of new and evolving perspectives has become increasingly challenging for scholars, and it has resulted in fragmented construct development practices within the IS community (Schmitz & Storey, 2020). As a result, there appears to be no consistent standard with respect to how measurement items should be assessed before more thorough investigations of psychometric soundness are performed.

The aim of this paper is to provide a critical reflection on the practices that comprise the front-end of the construct development process (i.e., the steps preceding the psychometric examination of new measures). We begin this short paper by describing the method we used to assemble a sample of published construct development papers. Next, we systematically examine how researchers engage with the conceptualization, item generation and content validation steps. Finally, we discuss current IS construct development practices in light of the broader debate on construct development and identify areas demanding particular attention. These insights would benefit researchers seeking to develop new constructs as well as reviewers and editors who evaluate the papers that introduce such constructs. Additionally, we anticipate that this paper will prompt IS researchers to reflect on their own construct development practices.

Method

Sample Development

To identify construct development papers, we used a three-step approach: 1) identifying empirical IS papers that rely on constructs, 2) retaining papers that claim to develop new measures, and 3) identifying papers with a construct development focus (see Figure 1). Papers with a construct development focus are characterized by an emphasis on a focal construct representing the primary contribution of the paper (as opposed to testing a full-fledged model, or specific causal effects). Recent construct development paper exemplars include "mindful IT use" (Thatcher et al., 2018), "privacy uncertainty" (Al-Natour et al., 2020), "IT identity" (Carter et al., 2020), or "IT identity threat" (Craig et al., 2019).

To identify empirical paper thar rely on constructs, we performed a keyword search on the papers published in the Senior IS Scholars' Basket of eight journals between November 2000 and November 2020. For each journal, we queried two different databases from among the following: Springer, EBSCO, Sage, Science Direct, JSTOR, Informs, Google Scholars, Taylor & Francis, AIS eLibrary, and Wiley. Terms commonly used in empirical, theory-testing papers (e.g., "instrument", "construct", "scale", "measurement" and "measure") were combined with the terms "new" or "development". Altogether, the keyword search yielded 804 unique papers.

Second, the measurement section of the retained papers was quickly scanned to retain papers that declare using "self-developed" measures. Papers that solely rely on existing or adapted measures were excluded, unless those measures were used to create a new one. This resulted in 475 papers being removed from analysis. The remaining 329 papers have appeared in the *Journal of Management Information Systems* (65), *MIS Quarterly* (64), J*ournal of the Association for Information Systems* (52), *Information Systems Research* (46), the *European Journal of Information Systems* (44), The *Journal of Strategic Information Systems* (30), *Information Systems Journal* (18), and *Journal of Information Technology* (10).

Third, the remaining 329 papers were examined to retain all papers with a construct development focus. Such focus usually permeates either in the title of the papers (e.g., "*Complexity of Information Systems Development Projects: Conceptualization and Measurement Development*", in Xia & Lee, 2005, p. 45) or in the abstract (e.g., "*This study conceptualizes, operationalizes and validates the concept of Knowledge Management Competence as a four-phase multidimensional formative index.*", in Sedera & Gable, 2010, p. 296). To improve the reliability of the article selection process, each paper was coded by two independent raters. We observed that the coders agreed on their decision to retain the paper for the final sample in 84% of the cases (Kappa = .63). Reconciliation meetings took place throughout the process to handle conflicting cases. Upon completion of this task, 96 papers were retained for further analysis. These papers typically identify a new construct as a device to apprehend an emerging IS phenomenon and examine its impact on a range of outcomes (e.g., Al-Natour et al. 2020; Carter et al. 2020; Craig et al. 2019; Thatcher et al. 2018). Less frequently, these papers propose novel conceptualizations of existing constructs (e.g., Gold et al. 2001; Karahanna et al. 2006; Someh et al. 2019) or alternative operationalizations of existing constructs (e.g., Chin et al. 2008).

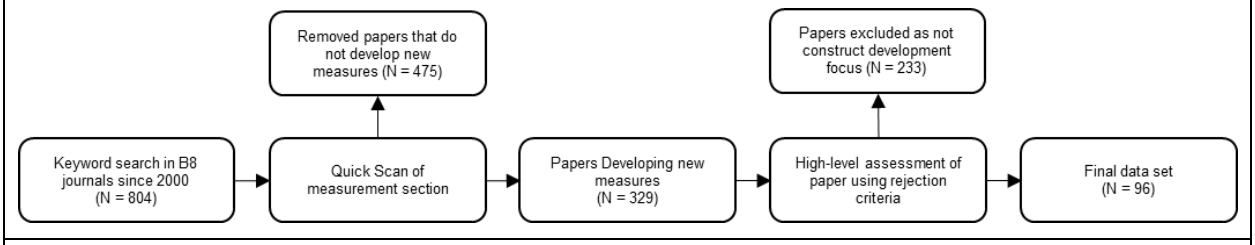

Figure 1. Flowchart of Paper Inclusion

Coding Procedure

Half of the 96 articles included in the review were coded by four coders who independently recorded the activities undertaken at the early stage of construct development[1] (i.e., conceptualization, item generation, and content validation). The coding categories were drawn from recently published papers providing operational guidelines on how to engage with these steps (Colquitt et al., 2019; P. M. Podsakoff et al., 2016) as well as recent systematic reviews of scale development practices (Cortina et al., 2020; Heggestad et al., 2019; Hendrick et al., 2013).

Conceptualization is the activity that consists of identifying the fundamental attributes of the focal construct and distinguishing it from related constructs (MacKenzie, 2003; Suddaby, 2010). To assess conceptualization practices, we operationalized Podsakoff et al.'s (2016) criteria of conceptualization. Specifically, we captured if and how the authors collect a representative set of definitions, if the

[1] The coding of the remaining articles is ongoing at the time of the submission of this paper.

dimensionality and stability of the construct are explained, if the construct is solely described in terms of examples and/or by reference to its consequences and antecedents, if the authors explain how the focal construct differs from related construct, if they provide a formal definition of the construct, and if this definition describes the type of property the construct represents, the entity to which the property applies and the attributes/characteristics of the construct.

Item generation is a process of generating a pool of items that accurately represent the construct's underlying content domain (Cronbach & Meehl, 1955). In general, researchers tend to opt for either a deductive (top-down) or inductive (bottom-up) approach, though neither approach precludes the use of the other (Hinkin, 1995). To assess the practices employed during item generation, we counted the number of initial items listed by the authors, how many were self-developed items, how many were retained in the final version, and the techniques used to generate these items (e.g., literature search, review of material, interviews, etc.). Additionally, we identified which reliability indexes were employed to gauge the quality of produced measures (i.e., Cronbach alpha, composite reliability, VIF, etc.), the value of this index, and if the authors solely rely on psychometric statistics for item retention/exclusion decisions.

Content validation is "the methodological process of gauging the degree to which scale items adequately sample the universe of content associated with a construct" (Colquitt et al. 2019, p. 1243). Measures that exhibit content validity demonstrate evidence of definitional correspondence (i.e., a scale's items are congruent with the definition of the focal construct), definitional distinctiveness (i.e., a scale's items are distinct from the definition of conceptually related constructs), and representativeness (i.e., the items collectively represent the entire content domain of the construct) (Colquitt et al., 2019; Cortina et al., 2020). Thus, we assessed whether the new construct had been vetted for correspondence, distinctiveness, and representativeness. Moreover, when distinctiveness was tested, we tracked whether any justification for the choice of conceptually or empirically confounding constructs was provided. Finally, we tracked what techniques were used to establish content validity, how many people were involved in these steps, and their profile (e.g., academics, practitioners, students, etc.).

Results

Conceptualization

Less than half (39%) of the coded articles collected a set of representative definitions to aid in the conceptualization of the construct. To define the fundamental attributes of the construct, researchers primarily search in the academic literature (88%), followed by a search of existing operationalizations (16%), and a search in the practitioner literature (14%). Most papers (82%) report on the dimensionality of the focal construct, and those papers reporting dimensionality introduce a multidimensional focal construct (73%). Few formal definitions (14%) fail to define either the property the focal construct represents (i.e., belief, capability, personal disposition, action, etc.), the entity to which it applies (i.e., person, task, process, etc.), or the fundamental attribute of the construct. 41% of the papers discuss how their definition of the focal construct differs from other existing definitions, or from the definition of other related constructs.

Item Generation

Although we found several papers in our sample that did not develop any new items but rather adapted existing ones to create a new measure, most papers created new items to operationalize the focal construct. When new items are created, the generation techniques are deductive (35%), inductive (19%), or hybrid (31%). The item generation technique was unspecified or unclear in 15% of the cases. While a deductive approach to item generation draws on domain definitions (either drawn from an existing framework or developed by the authors), inductive approaches tend to be more heterogeneous, combining either interviews, the practitioner literature, or other resources, as material for inspiration. Whenever this information was available, we recorded the size of the new measure (see Table 1). We find that construct development papers create an initial pool of 35 items, on average, and the average number of items in the final scale is 18. This indicates that half of the initially generated items were dropped during the construct development and validation process. The drop rate for self-developed items (53%) is twice as large as the drop rate for adapted items (27%).

	Initial scale	Final scale	Drop rate
Total	35	18	49%
Adapted	5	4	26%
Self-developed	30	14	53%

Table 1. Average Size of the Measures Introduced Along with the New Constructs

Content Validity

We find that 45% of the papers vet their measures for definitional correspondence by ensuring that their items are congruent with the content domain of the construct. Also, 14% verify definitional distinctiveness to ensure that a scale's item represents its intended construct rather than a conceptually related construct. While 41% of the papers mention something about representativeness, only 31% implemented a technique (usually a review from content domain experts) that would determine whether the measure fully covers the conceptual domain. As indicated in Table 2, researchers may resort to different techniques to verify the content validity of a new measure. We find that the most commonly used technique is a field pretest (59%), followed by card sorting approaches (37%), individual interviews (35%), and item review panels or focus groups (18%).

Technique	Implementation frequency	Average participants	Profile of participants ($1^{st}/2^{nd}/3^{rd}$)*
Panel / focus group	18%	16	P/A/S
Interview	35%	16	A/P/T
Item sorting	37%	9	A/P/S
Item correspondence rating	4%	16	A
Item clarity rating	4%	86	T
Field pretest	59%	37	T/A/P

* The three most frequently employed profiles are reported, in decreasing order. A: academics (incl. PhD students); P: practitioners; S: students (incl. graduate students); T: target questionnaire population; U: unspecified.

Table 2. Overview of the Techniques Used to Establish Content Validity

Discussions

Main Findings

Our investigations yield several important insights about our field's construct development practices at both a general level and at a level specific to the conceptualization and measurement of new constructs. At a general level, we find that 41% of the reviewed papers did not engage in any pretest as part of their measure development effort, relying solely on psychometric evaluations to refine their measure. Moreover, even when a pretest is conducted, it is not uncommon for researchers to skip tests of correspondence between the focal construct and its measures. These findings are striking as scholars have warned of the negative consequences of relying solely on psychometric soundness to gauge new measures (Burton-Jones & Lee, 2017; Cortina et al., 2020).

To better understand why such an approach is so common, we contrasted the papers that rely solely on psychometric properties with the remainder of our sample and found two main approaches to construct development: *psychometry-driven* and *content validity-driven*. In both approaches, researchers begin with a baseline conceptual definition from which they sample a large pool of items from the content domain. However, the approaches diverge in their handling of the scale reduction/purification process. The *psychometry-driven* approach is informed by early perspectives on construct development (Cronbach &

Meehl, 1955; Nunnally & Bernstein, 1994) where items are excluded over successive statistical validation procedures. In this approach, the empirical results dictate any adjustments to the conceptual framework. For example, when the factor structure emerging from a principal components analysis (PCA) is not strictly aligned with the conceptual definition, the definition is updated. In contrast, the *content validity-driven* approach employs complementary pretest techniques—sometimes in multiple successive rounds—to iteratively tighten the link between the conceptual definition and its measures. This approach is aligned with the semantic theory of survey responses which postulates that the primary source of statistical covariance in survey data is the degree of semantic overlap among related items (Arnulf et al., 2014). We conclude that these practices reflect two different construct development traditions, each carrying different expectations of what a "sound construct development process" should be.

Concerning the conceptualization stage, we find that most formal definitions meet the quality criteria explicitly set by (P. M. Podsakoff et al., 2016). Specifically, most papers correctly specify the property of the construct, the entity to which this property applies, and the attribute or theme to which the construct refers. Thus, we conclude that many definitions provide "a concise, clear verbal expression of a unique concept that can be used for strict empirical testing" (Wacker 2004, p. 631). However, less than half (41%) of the papers explain how the focal concept differs from related concepts, which dramatically undermines conceptual clarity (Suddaby, 2010). This is important because failing to establish conceptual distinctiveness "obscures the pattern of findings in the literature, results in the development of multiple or conflicting measures of the concept and impedes theoretical progress." (Podsakoff et al. 2016, p. 172). Though a more systematic "conceptual discriminant validation" (Cortina et al., 2020) would be needed to combat issues of construct proliferation (Bruner, 2003; Shaffer et al., 2016; Singh, 1991) and construct identity fallacy (Larsen & Bong, 2016), one possible reason for the lack of concern for construct distinctiveness could stem from some uncertainties concerning how this could be convincingly established.

Concerning the measurement stage, we find that a handful of papers (10%) rely *solely* on existing or adapted items. Thus, it appears that the practice of building new psychological constructs by combining older constructs (i.e., construct mixology, see (Newman et al., 2016)) is an emerging IS practice. To some extent, this is to be expected as the field moves from a state of conceptual fragmentation to a state of greater conceptual and operational convergence (Sumpter et al., 2019). Regardless, we find that many papers rely on existing validated measures as part of their own construct development process, perhaps suggesting that scholars thoroughly review existing related measures before engaging in costly item development efforts.

Also, our analysis reveals that content validity is rarely assessed, corroborating the conclusions of prior reviews of the construct development process (Boudreau et al., 2001; Burton-Jones & Lee, 2017; London et al., 2017; Schmitz & Storey, 2020). In fact, 41% of papers overlook all three aspects of content validity (i.e., correspondence, distinctiveness, and representativeness), an alarming when considering the nature of our sample of selected papers. Further, we find that while there is evidence of efforts to establish correspondence (i.e., items map onto intended constructs), efforts to establish distinctiveness (i.e., the items do not map onto unintended constructs) are scant (45% versus 14%). These findings are particularly alarming given that an implicit goal of construct development papers is to contribute to building a cumulative IS tradition by introducing thoroughly validated constructs (MacKenzie et al., 2011). Though more research is needed, such oversights make room for two adverse consequences: measurement contamination (i.e., the new measure captures aspects that are not part of the focal construct) and scale redundancy (i.e., the new measure reflects the content domain on an already existing construct).

Limitations

One key limitation of this work lies in the fact that our conclusions depend on the information that is reported in the published versions of the papers we have assessed. Our own experience suggests that information about content validation efforts may be shared with review panels but are not reported in the final manuscript. This corroborates other studies that found that in empirical papers, the measure development section is the most opaque section (Heggestad et al., 2019). The IS field does not seem to be immune to this issue, as several papers fail to explain the origin of their measures or provide enough concerning the pretests conducted (e.g., number of rounds, number of participants, profile of the participants).

Another challenge of this work lies in the subjective nature of some of some of our codes. For instance, whether authors successfully establish the "conceptual distinctiveness" of their focal construct involves a

high degree of judgment. Bearing this challenge in mind, we took steps to limit the subjectivity of our coding process by creating a code book that makes the coding categories explicit, holding regular reconciliation meetings, and formalizing the lessons learned when disagreements arise.

Actionable Suggestions for Future Research

A few actionable suggestions can be outlined for authors who wish to develop new IS constructs. First, authors should reinforce methodological transparency (Aguinis et al., 2018) through a more systematic and detailed reporting of the measure development steps. At a minimum, authors should report the baseline number of items with which they started and how many items were discarded at every step. In addition, authors should be more specific regarding whether they borrowed, adapted, or created new items. Altering existing measures (shortening, modifying wording, changing referent, etc.) is totally acceptable as long as those changes are documented (Heggestad et al., 2019). For papers that form new constructs by combining components of existing ones, it is critical to explicitly acknowledge how existing components have been used (Newman et al., 2016).

Second, improving conceptual and empirical distinctiveness should be an explicit focus of the first few steps of the construct development process. Currently, distinctiveness is mainly established using discriminant validity procedures involving exploratory factor analysis. Unfortunately, these procedures generally involve only a handful of antecedent or consequence constructs from the same research model. A more effective way of establishing distinctiveness entails the purposeful selection of "orbiting" constructs, namely constructs that 1) occur at the same stage in the causal flow as the focal construct (i.e., not an antecedent or consequence), 2) use the same referent (e.g., an IS, the organization, etc.) as the focal construct, and 3) are well-established within the scientific field (Colquitt et al., 2019). Orbiting constructs can be identified using a combination of tools, including searching citation databases, soliciting senior scholars or content domain experts (Shaffer et al., 2016), and using dedicated tools such as the Semantic Scale Network[2] (Rosenbusch et al., 2020) or TheoryOn[3]. Orbiting constructs may then be used in typical card sorting or item rating exercises as a means of producing empirical evidence of distinctiveness.

Conclusions

This short paper attempts to clarify the standards that are espoused and enacted by the IS scholarly community at the early stage of the construct development process (i.e., conceptualization, item generation, content validation). It is our hope that clarifying these issues will help future IS researchers to develop more rigorous, defensible, and insightful constructs.

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