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

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Short Paper

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Abstract

Include your abstract here followed by the keywords as indicated. The abstract should not be longer than 150 words.

Keywords: construct development process, methodologies, introspective, 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 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 and Gefen 2004). But despite extensive support in the development of high-quality constructs, there remains much confusion regarding how to best engage with Step 1 (conceptualization), Step 2 (item generation), and Step 3 (content validation) of MacKenzie et al.'s (2011) framework. Recognizing this issue, Burton-Jones and 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 and Vandenberg 2014, p. 590)

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 and Vandenberg 2014; Burton-Jones and Lee 2017; Gehlbach and Brinkworth 2011). Further, there is growing concern that a lack of rigor during these early stages will lead to the introduction of redundant measures (Bruner 2003; Larsen and 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 and 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 several 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 and Vandenberg 2014; Burton-Jones and Lee 2017; Gehlbach and 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). Also, the conceptualization phase has received increased attention in reference fields with researchers providing guidelines on how to create better conceptual definitions in marketing (Gilliam and Voss 2013; MacKenzie 2003), human resources management (Johnson et al. 2012), organizational science (Podsakoff et al. 2016), and operations management (Wacker 2004). By investigating current research practices, we can better assess the degree to which IS researchers have appropriated these recommendations and whether such appropriation has been faithful.

Second, the content validation techniques that provide empirical evidence of a new measure's correspondence to the focal construct have undergone substantial refinement (Colquitt et al. 2019) and benefited from the introduction of novel assessment techniques (e.g., Podsakoff et al. 2012; Rosenbusch et al. 2020). Keeping track of new and evolving perspectives has become increasingly difficulty and has resulted in widely divergent practices within the IS community (Schmitz and 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. Thus, it is necessary to examine which content validation activities are undertaken and if necessary, to clarify best practices.

Finally, there is an enduring confusion as to what constitutes a legitimate construct development process. This is particularly evident when considering related issues such as scale adaptation (Heggestad et al. 2019), construct remixing (i.e., combining existing measures to form new ones) (Newman et al. 2016), or updating venerable constructs to ensure relevance (Compeau et al. 2022). These distinctions may be clear in theory but they are blurred in practice. For example, it is recommended that researchers revalidate existing scales whenever they have been adapted (Heggestad et al. 2019), but it is unclear whether combining existing measures to form new constructs constitutes an adaptation (Newman et al. 2016). This ambiguity may be resolved by carefully examining the activities that are carried out in "pure" construct development papers.

To clarify the construct development standards that are both espoused and enacted in IS research, it is necessary to review the current practices in the conceptualization and development of measurement scales. To our knowledge, there is no in-depth review of the

activities that are undertaken at the conceptualization, item generation, and content validation stages of construct development. Indeed, though past reviews have investigated the stages of the construct development process (e.g., Boudreau et al. 2001), they often sacrifice depth in favor of breadth, and important issues remain unexplored. Also, more recent reviews tend to focus on specific technical considerations that arise during the early stages of the process (cf. Schmitz and Storey's (2020)). While beneficial, these reviews may not offer the much-needed integrative view that connects the conceptualization, item generation, and content validation steps.

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 by describing the method we used to assemble a qualified 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

Initial search and keywords

To identify articles focused on developing new constructs, we conducted a systematic literature search combining automated keyword searches and human judges to build a sufficiently representative sample (Figure 1). First, 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 representative of the construct development process (e.g., "instrument", "construct", "scale", "measurement" and "measure") were combined with the terms "new" or "development". Altogether, the keyword search yielded 804 unique papers.

Article inclusion and exclusion criteria

To enhance the quality of the sample and ensure that the papers in fact developed a new construct, we supplemented the automated keyword search with human judgement. Prior to coding, steps were taken to ensure reliability. First, three authors independently coded a random subsample of 90 papers (11% of publications identified via keyword search) as either developing a new construct or not. Then, interrater reliability was calculated using Feiss' Kappa and a score of 0.85 was obtained, indicating sufficient agreement (Landis and Koch 1977) to justify to splitting the remaining sample equally among the coders. 475 papers were removed because it was determined they did not develop a new construct.

As our goal is to understand the practices employed during the construct development process, assessed each of the remaining 329 articles to ensure that they are explicitly focused on developing a new construct. That is, we sought to exclude papers that develop constructs out of necessity for testing theoretical models. To ensure reliability, we opted for a full crossed coding design whereby two coders independently assessed the abstract, literature base and methods to determine whether the research represents a pure construct development focus. Reconciliation meetings took place throughout the process to handle conflicting cases. Lessons learned from this reconciliation process were duly

documented, and the coding rules were updated accordingly. Upon completion, 96 papers remained for further analysis.

The remaining 96 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).

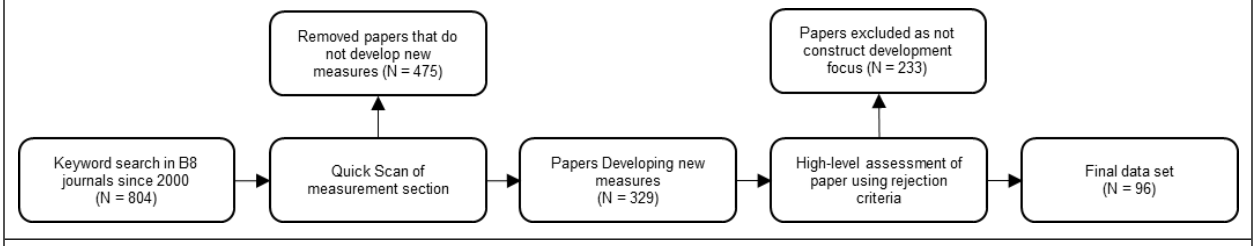

Figure 1. Flowchart of paper inclusion

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 (e.g., Colquitt et al., 2019; P. M. Podsakoff et al., 2016) as well as recent systematic reviews of scale development practices (e.g., Cortina et al., 2020; Heggestad et al., 2019).

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 dimensionality and stability of the construct are explained, if the construct is described or 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 the author 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 and 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

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

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 most papers reporting dimensionality are conceptualizing 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 5 papers in our sample that did not create new items but rather combined existing measures to create a new one, most papers rely on self-developed items to operationalize the focal construct. When new items are developed, 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.

Whenever this information was available, we recorded the size of the measures that were introduced along with the new constructs (see Table 1). We find that construct development papers create an initial pool of 35 items, on average, and the final number of items 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 (53.15%) is twice as large as the drop rate for adapted items (26.59%).

	Initial	Final	Drop rate
Total	35	18	48.90%
Adapted	5	4	25.59%
Self-developed	30	14	53.15%

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 paper mention something about representativeness, only 31% implemented a technique (usually a review from content domain experts) that would assess whether the measure fully covers conceptual domain. As indicated in Table 2, researchers may resort to different techniques to verify the content validity of their new measure. We find that the most widely used technique is a field pretest (59.18%), followed by card sorting approaches (36.73%), individual interviews (34.69%), and item review panels or focus groups (18.37%).

Technique	Implemented	Participants	Profile (*)
Panel / focus group	18.37%	16	P/A/S
Interview	34.69%	16	A/P/T
Item sorting	36.73%	9	A/P/S
Item correspondence rating	4.08%	16	A
Item clarity rating	4.08%	86	T
Field pretest	59.18%	37	T/A/P

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

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

Discussions

Main findings

A primary aim of this research is to better understand the extent to which IS researchers adhere to best practices when seeking to develop new constructs. To do so, we examined construct development-focused articles published in AIS basket journals over the last 20 years. Our investigation of these articles yields 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. First, we find that 41% of reviewed papers rely solely on psychometric evaluations to assess measurement quality. Surprisingly, it is not uncommon for researchers to skip tests of correspondence between the focal construct and its measures. This finding was striking as scholars have warned of the negative consequences of relying solely on psychometric soundness to gauge new measures (Burton-Jones and 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 scale reduction. The *psychometry-driven* approach is informed by early perspectives on construct development (Cronbach and Meehl 1955; Nunnally and Bernstein 1994) where items are reduced over successive statistical validation procedures. In this approach, the empirical results dictate any adjustments to the conceptual framework (e.g., when the factor structure emerging from a principal components analysis

(PCA) is not strictly aligned with the conceptual definition). Conversely, 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).

For the conceptualization stage, we find that most formal definitions meet the quality criteria explicitly set by 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. 193). Though a more systematic "conceptual discriminant validation" (Cortina et al. 2020, p. 1356) would be needed to combat issues of construct proliferation (Bruner 2003; Shaffer et al. 2016; Singh 1991) and construct identity (Larsen and Bong 2016), one possible reason for the lack of concern for construct distinctiveness could stem from an uncertainty about existing guidelines.

For the measurement stage, we find that contrary to our expectations, a handful of papers (10%) rely *solely* on existing or adapted items. This is surprising as one would expect construct development-focused projects to contribute some self-developed measures. 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 emerging in IS. 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 papers, perhaps suggesting that scholars thoroughly review existing related measures before engaging in costly item development efforts. However, more work is needed as it is unclear the extent to which scholars acknowledge the implicit semantic link between their focal construct and the constructs from which items are borrowed.

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; London et al. 2017; Schmitz and Storey 2020). In fact, 41% of papers overlook all three aspects of content validity (i.e., correspondence, distinctiveness, and representativeness). Further, we find that though 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 rare (45% versus 14%). To firmly establish definitional distinctiveness, scholars must incorporate orbiting constructs that 1) occur at the same stage of the causal of the focal construct (i.e., not an antecedent or consequence), 2) uses the same referent (e.g., an IS, the organization, etc.), and 3) is preferably well-established within the scientific field (Colquitt et al. 2019). Unfortunately, our results show this practice to be uncommon. 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 version of the paper. Our own experience suggests that information about content validation efforts may be deemed ancillary and may thus be omitted. This corroborates other studies that found that in empirical papers, the measure development section is one of the most opaque, often omitting many important details (Heggestad et al. 2019). Our field is not immune to this, as several papers do not clearly explain the origin of their measures or provide very few details concerning the nature of the pretests conducted (e.g., number of rounds, number of participants, profile of the participants).

Another challenge of this work lies in 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. However, 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 lessons learned when disagreements arise.

Future research and outlook

As the pool of readily available constructs increases, researchers may identify opportunities to combine elements of existing constructs to form new ones, a practice known as construct mixology (Newman et al., 2016). This practice can produce higher-order conceptualizations that reveal novel theoretical insights (Sumpter et al., 2019), and our review indicates that this practice is gaining traction in IS. Unfortunately, little is known about this practice and the pitfalls that come with it, providing opportunities for clarification.

When researchers identify deficiencies in current measures of constructs, they sometimes introduce novel measurement alternatives. This practice may encompass widely different techniques from minor scale adaptations (e.g., modifying the response anchors) (Heggestad et al. 2019) to changes that alter the nature of the relationship between the construct and its measures (Petter et al. 2007). Recent research suggests that updating construct measures is a growing component of IS research (Compeau et al. 2022), but little is known about these practices and their implications for theory building, indicating a need for future work.

Conclusion

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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