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Scale Development Process

"Deeply held but often unspoken safety-related beliefs, attitudes, and values that interact with an organization's systems, practices, people, and leadership to establish norms about how things are done in the organization. Safety culture is a subset of, and clearly influenced by, organizational culture. Organizations often have multiple cultures or subcultures, and this may be particularly true in construction." (NIOSH/CPWR, 2013, p.14)

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Developing A Safety Culture Measure

The development of a psychometrically valid scale is universal across domains and fields. Therefore, the process will be standard, but the content will be specialized, that is, construction safety culture specific. An article published in 1995 by Timothy Hinkin of Cornell University has become one of the best practices in scale development. The article emphasizes the importance of assessing reliability and validity of the newly developed scales which provides theoretical and practical support for any newly developed measure.

Stage 1: Item Generation

The main concern of this stage is content validity, that is, does the construct capture the construct of what it intends to measure; for example, safety culture. The goal is to capture the construct of interest without any extraneous items. Item generation can be either **deductive** and **inductive.** The **deductive** approach requires the researcher to develop a theoretical definition of the construct, which is then used to guide the development of the items. Researchers can examine past literature and use subject matter experts to identify critical incidents related to the construct. The **inductive** approach does not require theory, but instead a sample of respondents (employees) that are asked to describe the construct (safety culture). Further, the items are then sorted into categories through a process of content analysis. If items are conceptually inconsistent, they can be removed from the pool of items (less than 80% agreement).

Stage 2: Scale Development

After developing a list of potential items for the construct(s), the next step is to assess the psychometric properties of the scale (reliability and factor structure). The sample to test the initial scale must be selected with care and should attempt to represent the population of interest (i.e., construction employees, supervisors, contractors). Areas to note in this stage include removing reverse scored items, identifying an appropriate number of questions as not to disrupt the reliability and validity of the scale, to select a scale (1-5, 1-10, etc.) that is appropriate, and to ensure there is a large enough sample of employees to reach statistical significance.

Stage 3: Scale Construction

Factor analysis techniques are the most common method for refining scale constructs. The goal is to capture the content of each construct being measured by keeping items that load together and removing items that are inconsistent. Exploratory and confirmatory factor analysis techniques both examine the stability of the factor structure.

Stage 4: Reliability Assessment

Testing the internal consistency of the newly selected items is important to understanding how stable the scale will be over time and multiple uses. The higher the internal the consistency, the higher the reliability over time and administrations. An internal consistency of .70 out of 1.0 is the minimum acceptable standard.

Stage 5: Scale Evaluation

The next stage is to assess the criterion-related validity, that is, does the new scale correlate to similar constructs and not correlate with dissimilar constructs. A new sample should be used at this step to support scale generalizability.

The steps outlined above are a general process that can be applied to any construct. In the case of safety culture assessment, it has been recommended to include open-ended responses, as to help provide context for the scale responses. A Mixed methodology is becoming more popular in culture research as qualitative and quantitative methods can provide a more accurate picture of an organization's safety culture.

T. Hinkin. (1995). A review of scale development practices in the study of organizations. *Journal of Management, 21*(5), 967-988.