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Building a roadmap for content validation: 6C model and validity index

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Abstract
Background and Purpose: The validity of the content can be determined by its validity. The usefulness of the sampled content from a certain domain determines the content validity of an instrument. This study aimed to establish a model the content validity of a questionnaire assessing the "Organizational Hierarchy" domain using a systematic approach based on the 6C Model and Content Validity Index (CVI).
Method: Content validation was conducted in six stages, as per the 6C Model: Creating a form for content validation, choosing an expert review panel, completing content verification, Considering the objects and domain, causing a grade for each item, and CVI Calculation. The panel of experts assessed the relevance of 18 items using predefined criteria.
Results: The results indicated high levels of content validity. Item Content Validity Index (I-CVI) scores revealed unanimous agreement among experts for most items, with I-CVI scores of 1. The Scale-Level Content Validity Index Using Average Method (S-CVI/Ave) was 0.94, demonstrating strong consensus among experts. The Scale-Level Content Validity Index based on the Universal Agreement method (S-CVI/UA) was 0.78, indicating substantial but not complete agreement.
Conclusion: Content validation is a critical step in ensuring the overall validity of assessments, and this study provides a structured and evidence-based approach for researchers. By following the 6C Model, researchers can establish the Content Validity Index (CVI) for their questionnaires, contributing to the credibility of their instruments. The findings underscore the importance of rigorous content validation in questionnaire development and measurement instrument assessment.

Keywords: Validation, content validity, content validity index (CVI), questionnaire validation, 6C model, instrument development

Introduction
Validity of content is a good indicator of quality (Kerlinger, 1966; Yaghmaie, 2003) [6, 13]. A content validity test determines the validity of an instrument based on the usefulness of the sampled content (Nunnally, 1975; Yaghmaie, 2003) [8, 13]. A measurement instrument's content validity refers to the extent to which it covers the material it is designed to measure (Bush, 1985; Yaghmaie, 2003) [2, 13]. Additionally, it refers to the appropriateness of the sampling of the information that needs to be measured (Polit & Hungler, 1998; Yaghmaie, 2003) [11, 13]. The comprehensiveness and representativeness of a scale's content are thus assessed by its content validity. The sampling of the items and the process used to create the items are the first two criterions for assuring content validity (Nunnally, 1975; Yaghmaie, 2003) [8, 13]. The validity of content depends on two judgments: the selection of items that encompass all characteristics of the traits and their measurable extent. Instrument content validity measurement and reporting are crucial. This kind of validity can also support construct validity and foster trust in instruments across readers and researchers. The important factors are measured using content validity. Validity is also known as logical validity, content validity, intrinsic validity, relevance validity, and representative validity. It can assist in determining whether the subject matter of the questionnaire is appropriate (Yaghmaie, 2003) [13]. Literature, participants of the appropriate populations, and experts are the three sources used to determine the content validity (Burns, 1993) [1]. It is also possible to establish content validity in two stages: development and judgment. It is further mentioned that the creation of the instrument should come first before addressing content validity.

Finding the appropriate "what domain of construct" to measure is the initial stage in the instrument development process. Through literature reviews, interviews, and focus groups, this can be discovered. It is possible to have a clearer understanding of the subject's constraints, dimensions, and components by defining the features of interest with greater accuracy. The domain and construct concepts that are of importance in this case can be identified with the use of the qualitative technique (Yaghmaie, 2003) [13]. A vital first step in improving an instrument's construct validity is to assess a scale's content validity (S-CVI) (Haynes & Others, 1995; Polit *et al*., 2007) [5, 10]. The content validity of a measurement tool, such as a questionnaire, measures the degree to which it accurately captures the construct being measured (Polit *et al*., 2007; Wynd *et al*., 2003) [10, 12]. There is no comprehensive statistical method or objective method for evaluating an instrument's content validity (Dempsey & Dempsey, 1981; Yaghmaie, 2003) [13]. However, the judgment stage's content validity is supported by quantitative data (Yaghmaie, 2003) [13]. This novel technique provides a methodical way to judge content authenticity. Every "C" is important in figuring out how trustworthy and high-quality a piece of digital content is overall. In the modern digital era, the 6C Model and Validity Index offer a blueprint for content validation that is both contemporary and crucial.

Method for Content Validation (6C)

Content verification is based on the 6C Model:

C_1: Creating a form for content validation
C_2: Choosing an expert review panel
C_3: Completing content verification
C_4: Considering the objects and domain
C_5: Causing a grade for each item
C_6: CVI Calculation

C_1: Creating a form for content validation

To ensure that the review panel of experts has clear expectations and understanding of the task, the first step of content validation is to create a form for content validation. As shown in Figure 1, the rating and instruction scale is illustrated. For grading individual items, the recommended relevance rating scale (Davis, 1992; Lynn, 1986, 1986; Polit *et al*., 2007; Polit & Beck, 2006) [3, 7, 10, 9] has been applied. To facilitate the scoring process by experts, the definition of domain is recommended (Yusoff, 2019) [14]. See Figure 2 for an example.

VALIDATION OF REVAMPING FOOTBALL DELHI QUESTIONNAIRE (RFDQ): A CONTENT VALIDITY QUESTIONNAIRE

Dear Experts,

I, **Prokash Roy** Ph.D. Scholar in the Department of Sports Management & Coaching at Lakshmibai National Institute of Physical Education (LNIPE) Gwalior, would like to acknowledge that I am pursuing Ph.D. entitled **"Revamping of Football Delhi: A Case Study."** This research is supervised under the guidance of Dr. **Krishna Kant Sahu**, Associate Professor in the Department of Sports Management and Coaching, LNIPE, Gwalior.

The questionnaire consists of 6 variables:

1. Organizational hierarchy,

2. Player Development and Talent Identification,

3. Financial management,

4. Promotional strategies,

5. Media, and

6. Sponsors.

These are 6 domains and 93 items in this inventory that are associated with "Revamping Football Delhi". Regarding how relevant each item is to the domains being measured, we require your professional opinion. The definition and appropriate terms that you have been given should serve as a framework for your review. Please use the following rating scale in your evaluation and try to be as objective and helpful as you can:

Degree Of relevance:

1 = the item is not relevant to the measured domain

2 = the item is somewhat relevant to the measured domain

3 = the item is quite relevant to the measured domain

4 = the item is highly relevant to the measured domain

Thank you for your time and assistance.

Yours Sincerely

Prokash Roy

Fig 1: A sample instructional form with a rating scale for the experts

Table 1: This is an example layout for content validation to show the domain, its definition, and the items representing (Measuring) the domain

Domain: "Organizational Hierarchy" of Revamping of Football Delhi (FD) Definition: Opinion of stakeholders on "Organizational Hierarchy" and how FD has developed over the previous five years				
Tested Items	**Relevance**			
1. There is an understanding of the Football Delhi strategies among employees.	1	2	3	4
2. Football Delhi employees share a common vision for the future.	1	2	3	4
3. The employees and stakeholders of Football Delhi always looking for better ways to do their jobs.	1	2	3	4
4. Football Delhi is committed in creating environment for innovation and reasonable risk-taking.	1	2	3	4
5. Football Delhi's employees are informed and involved at all times.	1	2	3	4
6. Employees have a positive impact on Football Delhi.	1	2	3	4

C_2: Choosing an expert review panel

The person chosen to review and analysis an assessment tool (such as a questionnaire) is typically chosen based on their level of competence with the subject matter. CVI cut-off scores are explained in Table 1 using the recommended number of experts. It most suggestions call for a minimum of six experts in the field for content checking, although two experts are generally considered adequate. Based on recommendations (Davis, 1992; Lynn, 1986, 1986; Polit *et al*., 2007; Polit & Beck, 2006) [9-10] and the author's experience, a minimum of 6 experts are recommended for content validation.

Table 2: Expert diversity and the CVI cut-off score.

Number of experts	Acceptable CVI values	Source of Recommendation
2 experts	At least 0.80	(Davis, 1992) [3]
3 to 5 experts	Should be 1	(Polit *et al*., 2007; Polit & Beck, 2006) [10, 9]
At least 6 experts	At least 0.83	(Polit *et al*., 2007; Polit & Beck, 2006) [10, 9]
6 to 8 experts	At least 0.83	(Lynn, 1986) [7]
At least 9 experts	At least 0.78	(Lynn, 1986) [7]

C_3: Completing content verification

Either a face-to-face or a virtual method can be used for content validation. An expert panel meeting is planned for the face-to-face method, and the researcher assists C_4 to C_5 of the content validation process (Which will be discussed later). When using a non-face-to-face method, the experts are usually given an online form for content validation along with detailed instructions (Figure 1) to make the process easier (C_4 to C_5). Cost, time, and response rate are the three most crucial variables that must be taken into account. Due to the difficulty in gathering all specialists in one place, the cost and time may be the most difficult aspects of doing a face-to-face approach, but the response rate will be at its maximum. The non-face-to-face strategy might be challenging because of the response rate and time issues, but the cost savings are its biggest benefit. However, the non-face-to-face technique, based on the author's experience, is very effective if a systematic follow-up is put in place to increase the response rate and time (Yusoff, 2019) [14].

C_4: Considering the objects and domain

In Figure 2, the experts are given explicit instructions regarding the domain and the items that are part of the domain. In order to assess each item, experts must critically evaluate the domain and its components before assessing it. To increase the items' relevance to the intended subject, experts are urged to offer verbal or written opinion. The domain and its items are refined in response to any comments.

C_5: Causing a grade for each item

After studying the domain and items, the experts are asked to independently assign a score to each item using the appropriate scale (Figures 1 and 2). Once they have fully provided the score on every issue, the experts are obliged to provide their responses to the researcher.

C_6: CVI Calculation

There are two types of CVI: scale-based CVI (S-CVI) and item-based CVI (I-CVI). S-CVI can be calculated in two ways: by calculating the proportion of items on the scale that received a relevance score of 3 or 4 from all experts (S-CVI/UA) and by calculating the average of I-CVI values for all items (S-CVI/Ave) (Polit & Beck, 2006) [9]. Table 2 provides a summary of the CVI indexes' definitions and formulation. Before the CVI calculation can be performed, the relevance rating must be encoded as 1 (relevance scale of 3 or 4) or 0 (relevance scale of 1 or 2). Six experts' relevance evaluations on an item scale are shown in Table 3 to show how various CVI indices are calculated. The examples of calculations below are based on the data in Table 3 and serve to demonstrate how the CVI indices are calculated (see Table 2 for details).

Table 3: Definitions and formulas for I-CVI, S-CVI/Ave, and S-CVI/UA

The CVI indices	Definition	Formula
Content Validity Index (I-CVI)	According to content experts, what percentage of items are rated three or four on relevance	(Agreed Item)/(Number of Experts) = I-CVI
S-CVI/Ave (Scale-Level Content Validity Index Using Average Method)	Average I-CVI scores for all items on the scale or proportion relevance judged by all experts. Proportion relevant is the average of the relevance ratings by each expert.	The S-CVI is calculated as the sum of the I-CVI scores divided by the number of items in the I-CVI. (Sum of Proportion Relevance Rating) / (Number of Experts) = S-CVI / Ave
S-CVI/UA (Scale-Level Content Validity Index based on the Universal Agreement method)	This is the percentage of items on the scale that are rated 3 or 4 by all experts. A Universal Agreement (UA) score of 1 indicates that 100% of experts agree on the item; otherwise, a UA score of 0 indicates no agreement at all.	(Sum of UA Scores) / (Number of Items) = S-CVI/UA

Note: This definition and formula were developed based on the recommendations of (Davis, 1992; Lynn, 1986, 1986; Polit *et al*., 2007; Polit & Beck, 2006) [3, 7, 10, 9].

Table 4: The relevance ratings on the Item Scale by 6 experts

	Expert-1	Expert-2	Expert-3	Expert-4	Expert-5	Expert-6		Expert in Agreement	I-CVI	UA
Item										
Q1	1	1	1	0	1	1		5	0.83	0
Q2	1	1	1	1	1	1		6	1	1
Q3	1	1	1	1	1	1		6	1	1
Q4	1	1	1	1	1	1		6	1	1
Q5	1	0	1	1	1	1		5	0.83	0
Q6	1	1	1	1	1	1		6	1	1
Q7	1	1	1	1	1	1		6	1	1
Q8	1	1	1	1	1	1		6	1	1
Q9	0	1	1	1	0	1		4	0.66	0
Q10	1	1	1	1	1	1		6	1	1
Q11	1	1	1	1	1	1		6	1	1
Q12	1	1	1	1	1	1		6	1	1
Q13	1	1	1	1	1	1		6	1	1
Q14	1	0	1	0	1	1		4	0.66	0
Q15	1	1	1	1	1	1		6	1	1
Q16	1	1	1	1	1	1		6	1	1
Q17	1	1	1	1	1	1		6	1	1
Q18	1	1	1	1	1	1		6	1	1
								S-CVI/Ave	0.94	
Proportion Relevance	0.94	0.88	1	0.88	1	1		S-CVI/UA		0.78
	Average Proportion Of Items judged as relevance across the experts						0.95			

1. **Experts in agreement:** Add together the ratings provided by all experts for each item, for example, 5 for Q1.
2. **Universal agreement (UA):** For example, Q2 received 1 because all experts provided relevance ratings of 1, while Q1 received 0 because not all experts provided relevance ratings of 1.
3. **I-CVI:** The expert in agreement divided by the number of experts, for example I-CVI of Q1 is 5 divided by 6 experts that are equal to 0.83.
4. **S-CVI/Ave (based on I-CVI):** The average of all I-CVI scores, for example, S-CVI/Ave [0.83+1+1+1+0.83+1+1+1+0.66+1+1+1+1+1+0.66+1+1+1+1+1/18] is 0.94.
5. **S-CVI/Ave (based on proportion relevance):** This score is calculated using the average of the proportion relevance scores from all experts, so it is 0.95.
6. **S-CVI/UA:** A score of 0.78 is the average of all UA scores across all items, e.g., (1+1+1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1+0+1+1+1 + 1 + 1)/18.

According to the calculations above, I-CVI, S-CVI/Ave, and S-CVI/UA achieve satisfactory levels of content validity, and the questionnaire has reached satisfactory levels of content validity. With the exception of two items (Q9 and Q14), all sixteen I-CVI questions in this article's "Organizational Hierarchy" domain were accepted for further processing. The feedback and recommendations of the experts may cause this acceptance of the item question to be changed.

Results

The results of the study conducted using the 6C Model for content validation and the calculation of Content Validity Index (CVI) revealed that the questionnaire designed to assess the "Organizational Hierarchy" domain achieved satisfactory levels of content validity. The study involved six experts who independently assessed the relevance of 18 items. Based on the calculations, the following results were obtained:

Individual Content Validity Index (I-CVI) scores were determined for each item. The I-CVI scores are a measure of the percentage of experts who rated each item as relevant (a rating of 3 or 4 on the relevance scale). For most items, the I-CVI was 1, indicating unanimous agreement among the experts regarding the relevance of these items.

The Scale-Level Content Validity Index Using Average Method (S-CVI/Ave) was calculated by averaging the I-CVI scores for all items. In this case, the S-CVI/Ave was 0.94, indicating a high level of agreement among the experts on the relevance of the items.

The Scale-Level Content Validity Index based on the Universal Agreement method (S-CVI/UA) was calculated by determining the percentage of items on the scale that received a relevance score of 3 or 4 from all experts. The S-CVI/UA was 0.78, indicating that while there was substantial agreement among the experts; it was not unanimous for all items.

The study found that, with the exception of two items (Q9 and Q14), all other items achieved satisfactory levels of content validity. However, the researchers noted that the feedback and recommendations of the experts could potentially lead to changes in the acceptance of these two items in the future.

Conclusion

An assessment's content validity is vital to ensure its overall validity, so a systematic approach should be taken for content validation based on evidence and best practices. A systematic and evidence-based approach has been provided in this paper for conducting a proper content validation. This content may be useful for researchers who wish to establish the questionnaire's I-CVI and S-CVI.

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