

Article

Evaluating the Content Validity: Development of An Instrument for Measuring Functional Building Performance

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Abstract: Managing the selection of relevant criteria for functional building performance is essential for the building management team because it is strongly related with building occupants' satisfaction and achievement of organizational objectives. In the current state of functional building performance evaluation, previous studies have shown that the criteria vary that depends on the facility types and purpose of conducting performance evaluation. These selection criteria have a direct impact on functional building performance and need to be done in a systematic way. The content validity of the functional building performance evaluation instrument is essential step in the instrument development. Therefore, this research aims to evaluate the content validity of Functional Building Performance (FBP) evaluation by using Content Validity Index (CVI) and modified Kappa coefficient. In achieving this research aim, a set of questionnaires was developed based on numerous construct items that obtained from previous studies by various authors and researchers. The selected expert panel in the field of historic building management and building performance evaluation such as local municipality, related government agencies, academician and building management team reviewed and rated the instrument to ensure its relevance and representativeness of each item. The final instrument contained 39 items that is valid and considered to be retained and all items will be further tested in next study. The result also shown the S-CVI/ Ave for all items meet the criterion of 0.90.

Keywords: content validity; instruments: functional building performance; historic government administrative buildings.



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1. Introduction

In the past few decades, building performance is viewed as a concept that related to the business environment to ensure organizations meet with their objectives by focusing on user perception (Strelets et

al., 2016). In a similar way, (Gopikrishnan & Topkar, 2017) stated building performances is directly related to the core objectives for which the building is created. Many factors contributes towards the evolution of building performance such as shifting of building needs and environment changes (Khalil et al., 2015). The building performance criteria need to be identified to measure the performance. Several building performance elements and criteria can be involved based on the decision of organization on the specific purposes of evaluation and type of facility (Gopikrishnan & Topkar, 2017; Lavy et al., 2010). This study is focused on functional building performance evaluation.

Functional building performance denotes the successful of building supports the organization's objectives and occupants requirements (Strelets et al., 2016). Another study mentioned functional building performance concerns on the relation of the building and its occupant and focused issues on space, layout, ergonomics, image, communication, health and safety (Mat Yasin & Egbu, 2010). In Malaysia, historic buildings have high historical, significant, aesthetic and cultural values and regarded as essential in promoting tourism. It consists of government offices, institutional, residential, commercial, monuments, palaces etc. This study is centered on historic government administrative buildings that functioning in administration of government matters. It is important to maintain these building and evaluation should be done to ensure its function as intended.

The literatures also revealed the issue of inconsistencies in the elements and criteria for building performance evaluation (Mohammad et al., 2014). This is supported by Sharpe, (2013), Samareh Abolhassani et al., (2022) that stated an effective and systematic method to determine and measure criteria of building performance is not sufficiently established and variety of methodological and approach used in building performance evaluation. Therefore, the good selection of determinant criteria has direct impact to the performance in building. The content validity of the functional building performance evaluation instrument is essential step in the instrument development. Therefore, this research aims to evaluate the content validity of Functional Building Performance (FBP) evaluation by using Content Validity Index (CVI) and modified Kappa coefficient.

2. Literature Review

2.1. Building Performance

Building performance has a major role in articulating the expectation and requirement of owners and occupants that fulfilled by designers and building operators (Khalil et al., 2015), (Pati et al., 2006). It can then be concluded that building performance can be expected to have associated with the organization's objectives and goals that concerned on occupants' comfort and satisfaction. Hence, the evaluation on the building performance should be done by organizations to assure the buildings work effectively. Various methods can be used to evaluate the building performance in fulfills building occupants' requirements and satisfaction that include Post Occupancy Evaluation (POE), balanced scorecard approach and measurement through metrics of key performance indicators (KPIs). POE is the common method used and has been implementing during past decades in evaluating the building that can be adapted to a specific purpose and available (Li et al., 2018; Preiser, 1995).

2.2. Functional Building Performance

Literature survey on functional building performance evaluation shown that a number of authors and researchers have grouped various criteria or attributes based on purpose of evaluation and type of building. Criteria for measuring functional building performance should be derived from previous precedent research and established rating tools and standard. Therefore, the criteria involved in functional building performance are focused to thirteen (5) main criteria, i.e. space, comfort, aesthetics, amenities and operational management (Bajjou et al., 2019) as shown in Table 1.

2.3. Historic Government Administrative Buildings

Administrative and office building is one of the types of building that including government service buildings and voluntary sector, and also private and commercial offices (Aksah et al., 2021). The size of administrative and office buildings varies from a small, single-roomed tenancy in a multi-occupancy building to a large building. This administrative building should be designed appropriately to ensure the people regardless of age, size and disability could work or visit there. This administrative buildings are often acted as the symbol of political power and icon to promote the city (Mohidin & Ismail, 2014a). It also represent the identity of the society at country, states, region and district apart from functioning as a place to

govern the administration matters (Mohidin & Ismail, 2014b). A study has identified factors such as social culture, religious belief, colonialism, ethnicity and utilization of technology influence the design, size and setting of administrative buildings in Malaysia. Many historic government administrative buildings were built during pre to post independence for example Sultan Abdul Samad building (1897), Penang City Council building (1879), Rumah Persekutuan etc.

Table 1. Criteria in functional building performance evaluation

No.	Criteria	Description
1.	Space	This criterion refers to the ability of building to cater with users' capacity and concerned with the measured area and size. The size and layout of space within should also support the activities taking place in building and keep save the occupants. The sub criteria involve are size, relationship, room layout, adaptability, privacy, adequacy of signage, circulation area, access / entrance and emergency exit.
2.	Comfort	This criterion has a positive impact on well – being and a state of physical ease and free from any unpleasant feeling. The sub criteria involve temperature, ventilation, lighting, noise, glare, orientation, building related illness (BRI/SBS), Humidity
3.	Aesthetics	This criterion focuses on the design of a building such as shape, colour or form as a component of its cultural value that portray of intended image of historic government administrative building to the immediate environment. The sub criteria involve are harmonious, powerful, iconic, blend, neutral and material and finishes.
4.	Amenities	This criterion refers to desirable and useful features or facilities of a building or area that includes toilet, pantry, prayer's room, staff lounge, ramps and indicators for the disabled. The sub criteria involve are completeness, capacity, positioning, ergonomics, furnish quality, parking and disable person requirements.
5.	Operational Management	This criterion deals with the building users' requirements and organization goals and to keep equipment and system operating as designed or intended. The sub criteria involve are book and space allocation system, help desks, user support systems, manuals, training, information technology, security, serviceability, strategic value and life cycle cost.

2.4. Instrument Validation

Validity is a crucial aspect on the instrument that applied in research. A primary concern of (Polit et al., 2007) is the development of new scale of instrument are supposed to provide prove that the instrument is content valid. Supporting this view, Masuwai & Saad (2016) mentioned that much debated question is either the instrument are related with the intended subject of area. It can be also applied to existing instruments either has never been reported or has been simply untested (Lynn, 1986). Validity can be defined as the extent of instrument measures the intended to measure (Lynn, 1986). Similarly, validity can be defined as the ability of an instrument to assess the construct developed in study (Masuwai & Saad, 2016). 3 types of validity that commonly used in validity are content, criterion-related and construct (Almanasreh et al., 2019; Lynn, 1986).

Content validity can be defined as the extent of scale has an adequate sample of items to represent the construct (Gross et al., 2004). CVI is commonly used to measure the content validity of instrument that benefited in aspects of understandability, ease of computation, focus on agreement of relevance and provision of both item and scale measurement (Polit et al., 2007). Content Validity Index is the most widely applied and has been used for many years in quantification of content validity. It can be computed through Item – CVI (I-CVI) and Scale level – CVI (S-CVI) (Gross et al., 2004). Two (2) stages involve in content validity process i.e. development of instrument and judgement (Lynn, 1986).

3. Materials and Methods

3.1. Content Validity

The two stage method involved instrument design and acquiring judgment evidence (Lynn, 1986; Rodrigues et al., 2017; Zamanzadeh et al., 2015). For stage 1, the design of instrument is executed through

three (3) steps process that involve determination of content domain, item generation and instrument construction. The first step is to determine the contain domain of a construct for the instrument. Content domain is the content area that associated with the variables that being measured (Zamanzadeh et al., 2015). It can be identified and obtained by literature review on the subject being measured, interviewing with respondents and focus group. Based on the accurate and detailed of the attributes or variables, a clear image of its boundaries and measurements can be obtained. The second step is item generation that requires a preliminary task to determine the content domain of construct (Zamanzadeh et al., 2015). The third step is instrument construction that refined and organized in an appropriate and suitable format and sequence to ensure the items are collected in a usable form (Zamanzadeh et al., 2015).

The 40 initial items of this instrument derived from previous precedent research and established rating tools and standard that evaluated exercises or activities in functional building performance area. Items were generated from a systematic review that mentioned and evaluated criteria and sub criteria in functional building performance evaluation. The five (5) main criteria involved are (1) space; (2) comfort; (3) aesthetics; (4) amenities; and (5) operational management.

For stage 2, judgment evidence was conducted and obtained from expert panels (Lynn, 1986; Rodrigues et al., 2017; Zamanzadeh et al., 2015). This step requires confirmation form appointed expert panels, stipulating that the instrument have content validity. Determining the appointed expert panel involve is often depends on the numbers of accessible and agreeable persons can identify, not based on the population estimation principle (Lynn, 1986). Specific guideline should be complied on the selection of expert panel for content validity process. The expert panels are required to rate each scale to measure its relevance to the construct. (Lynn, 1986) stated that minimum of three (3) experts is required, and suggested that more than 10 is not desirable (Gross et al., 2004). Other study has concluded that the desirable number of expert panels in content validity process is 5 to 10 (Almanasreh et al., 2019).

3.2. Measurement Scale

The scale that used in instrument should conceptually and mathematically meaningful. A 4-point scale is desirable because it does not include middle rating even though a 3- or 5- point rating scale can be considered (Lynn, 1986). By applying a 4-point rating scale, it can provide adequately delineated information to calculate the value of CVI. Various scale can be used but most often is 1=not relevant, 2=somewhat relevant, 3=quite relevant and 4-highly relevant (Gross et al., 2004; Polit et al., 2007). Actual CVI is considered when the items obtained a rating of 3 or 4 by the experts (Lynn, 1986).

3.3. Procedure for Content Validity

On the basis of recommendation by the experts in the content validation field, seven experts were appointed and invited to review the instrument as shown in Table 2. The specific guidelines and requirement for the selection of the expert panels are: (i) Have at experiences or involvements in historic building management or building performance evaluation. (ii) For academicians, the panel must lead in research and various publications in historic building management or building performance evaluation and (iii) Familiar with the thematic domains or concept in building performance evaluation.

Table 2. Demographic of Expert panels

Panel	Position	Organization	Experience
1.	Senior Lecturer	Universiti Teknologi Mara	10 years
2.	Senior Lecturer	Universiti Malaya	21 years
3.	Curator	National Heritage Department	17 years
4.	Director of South Zone	National Heritage Department	20 years
5.	Senior Architect / Registered Conservator	Public Work Department	16 years
6.	Architect	Kuala Lumpur City Hall	7 years
7.	Senior Assistant Engineer	Pejabat Daerah Muar	11 years

The instruments were self-distributed to the selected expert panels with an introductory cover letter and content validity form. After that, the completed instruments and form were returned through the same medium or email. The panels were asked to comment and suggests on the extent to which a measurement reflects the specific intended domain of content.

3.4. Data Analysis

The CVI for each item is based on the proportion of rating 3 or 4 by expert panels. Meanwhile the CVI for the entire instrument is based on the proportion of total items considered as content valid (Lynn, 1986). Adopting the similar position, Polit et al. (2007) stated that CVI value can be calculated for each item (I-CVI) and for the entire scale (S-CVI). Researchers used I-CVI to assist them in revising, removing or replacing items (Gross et al., 2004). Meanwhile, There are two (2) methods to calculate the S-CVI i.e. S-CVI/UA (universal agreement) and S-CVI/Ave for all items on the scale (Gross et al., 2004). But these two (2) could lead to different values, therefore it confuses and risky to draw conclusion about the content validity and to adjust for chance agreement. It can be solved by translating the I-CVI into values of a modified kappa statistics (Polit et al., 2007), (Takim et al., 2016).

Polit et al., (2007) recommended a new way for the content validity i.e. modified kappa k that adjust each I-CVI for chance agreement. After calculating the value of I-CVI for all items, the Kappa modifies can be calculated by using the value of pc (probability of chance agreement) and I-CVI through this equation $k^* = (I-CVI - pc) / (1 - pc)$. The standard used by Polit et al., (2007) for the value for each k is fair (0.40-0.59), good (0.60-0.74) or excellent (>0.74). For example (Kovacic, 2018) applied both CVI and Kappa coefficient in their studies. Items with the value of I-CVI lower than .78 would be considered candidates for revision, and those with very low values would be candidates for deletion (Polit et al., 2007). Any items that recorded I-CVI of 0.50 or less is removed because this value considered unacceptable (Almanasreh et al., 2019). Polit et al., (2007) provided suggestions that any I-CVI of 0.78 higher and average-CVI of 0.90 higher, in addition of strong conceptual framework can be considered as excellent in term of content validity. Recommendations or suggestions from expert panels can be added without interfering with the judgment of content validity.

4. Results

The content validity of functional building performance evaluation instrument was carried out by using the CVI process that mentioned by Polit et al. (2007) and Lynn (1986). The seven (7) experts were requested to rate the items relevancy by using 4-point scale. Recommendation or suggestion from expert panels can be made at the comment section. Table 3 shows the I-CVI value for each item that stated on instruments. The calculation of modified kappa statistics (k) was calculated to adjust the chance agreement of expert panels. Items with I-CVI. For Item with the value of I-CVI more than 0.78 with greater kappa score were retained. For item with value of I-CVI lower than 0.78 should be considered for revision, combination or rephrase based on expert comments.

Table 3. Result of Content Validity

Items	Number in Agreement	Item- CVI	k	Evaluation
1-SPACE				
Size	7-Jul	1	1	Excellent
Relationship	7-Jun	0.86	0.85	Excellent
Room layout	7-Jul	1	1	Excellent
Adaptability	7-Jul	1	1	Excellent
Privacy	7-Jun	0.86	0.85	Excellent
Adequacy of signage	7-Jun	0.86	0.85	Excellent
Circulation Area	7-Jul	1	1	Excellent
Access /Entrance	7-Jul	1	1	Excellent
Emergency Exit	7-Jul	1	1	Excellent
2- COMFORT				
Temperature	7-Jun	0.86	0.85	Excellent
Ventilation	7-Jul	1	1	Excellent
Lighting	7-Jul	1	1	Excellent
Noise	7-May	0.71	0.65	Good
Glare	7-May	0.71	0.65	Good
Orientation	7-Jun	0.86	0.85	Excellent
BRI/SBS	7-Jun	0.86	0.85	Excellent

Items	Number in Agreement	Item- CVI	k	Evaluation
Humidity	7-Jul	1	1	Excellent
3-AESTHETICS				
Harmonious	7-Jun	0.86	0.85	Excellent
Powerful	7-Jun	0.86	0.85	Excellent
Iconic	7-Apr	0.57	0.45	Fair
Blend	7-Jun	0.86	0.85	Excellent
Neutral	7-Apr	0.57	0.45	Fair
Material and finishes	7-Jun	0.86	0.85	Excellent
4- AMENITIES				
Completeness	7-Jul	1	1	Excellent
Capacity	7-Jun	0.86	0.85	Excellent
Positioning	7-Jun	0.86	0.85	Excellent
Ergonomics	7-Jun	0.86	0.85	Excellent
Furnish quality	7-Jun	0.86	0.85	Excellent
Parking	7-Jul	1	1	Excellent
Disable Person Requirement	7-Jun	0.86	0.85	Excellent
5 – OPERATIONAL MANAGEMENT				
Book and space allocation system	7-Jun	0.86	0.85	Excellent
User support system	7-Jul	1	1	Excellent
Help desks	7-Jun	0.86	0.85	Excellent
Manuals	7-Jul	1	1	Excellent
Training	7-Jun	0.86	0.85	Excellent
Information Technology	7-Jun	0.86	0.85	Excellent
Security	7-Jul	1	1	Excellent
Serviceability	7-Jul	1	1	Excellent
Strategic value	7-Jul	1	1	Excellent
Life cycle cost	7-Jul	1	1	Excellent

As a result, a total of 36 items are valid and in excellent kappa coefficient rated. Meanwhile 4 items considered to be retained i.e. noise, glare, iconic and neutral and should be considered for revision, combination or rephrasing based on expert panels comment. Item iconic suggested to be combined with powerful as it redundant with item powerful. Consequently, a total of 39 items is valid and considered to be retained and all items will be further tested in next study. The result also shown the S-CVI/ Ave for all items meet the criterion of 0.90 as suggested by Polit et al., (2007)

5. Conclusion

In conclusion, the content validity should be treated as important because it can benefit in term of understandability, relevancy agreement, ease of calculation and provide both value for item and scale measurement. The two stages process that involve in content validity process comprise meticulous instrument development and judgment the items. Through the analysis of content validity of instrument involved in this study, it demonstrates an acceptable and adequate measurement for functional building performance evaluation of historic government administrative buildings.

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