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ESTABLISHING THE CONTENT VALIDITY INDEX OF POST OCCUPANCY EVALUATION (POE) OF GREEN BUILDING IN MALAYSIA

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ABSTRACT

A green building focuses on increasing the efficiency of resources in term of energy, water and materials, while at the same time reducing the building impact on human health and the environment during the building's lifecycle. Green buildings are significant in operational savings and are able to increase workplace productivity. There are 909 registered green buildings project up to September 2019 in Malaysia. However, previous research indicated the success of green building in term of its performance is still in doubt and very much speculative. In fact, there have also been reports saying that green building fails to perform appropriately. Unfortunately, up until now there are no standard performance criteria and performance parameters to measure the green building performance in Malaysia. Thus, the aim of this paper is to present the findings of the research which identify the performance criteria and parameters of Post Occupancy Evaluation (POE) for green building in Malaysia. Fifteen (15) performance criteria and thirty-five (35) parameters were identified from the literature and validated by green building experts by using Content Validity Index. The finding identifies eleven (11) performance criteria and twenty-six (26) performance criteria to measure the green building performance through POE. The findings from this research may turn as a new knowledge which identifies the performance criteria and performance parameters to conduct

Post Occupancy Evaluation (POE) for green building in Malaysia. Thus, government or private developer can use these performance criteria and performance parameters to measure their green building performance. This research was conducted within the context of Malaysian construction industry, thus, it cannot be generalised to other countries.

Keywords*: Post Occupancy Evaluation; Green Building; Building Performance Evaluation Criteria; Building Performance Evaluation Parameters*

INTRODUCTION

The comfortable and healthy working environment will create more satisfying workplace for the building's user, thus contributing to the higher productivity of workers (Altomonte & Schiavon, 2013; Nguyen & Gray, 2016; Paul & Taylor, 2008). Green building can be considered as the popular choices for most peripheral countries as their working places (Zhao, He, Johnson, & Mou, 2015). According to Zhao et al.,(2015), the idea of the green building can be deliberated as a major transformation in the history of the construction industry. The goal in the marketing of residential and commercial space has been changed in order to achieve the occupancy rate for the control of systematic construction and to provide a healthy and comfortable space for activities and sustainability of space. In the recent years, the development of sustainability in office buildings and the acceptance of these buildings in the broader property market are increasing.

Nowadays, green building, as a commodity, is becoming the focus of global attention under the influence of the incentive based market economy (Zhao et al., 2015). Society has accept the sustainability as their substantial interest and it has also gradually moved into the discipline of the built environment (Reed & Jailani, 2014). Moreover, real estate sector has increasingly put attention in green building and bring economic benefits to the building owner as the green building is able to save lifecycle costs and increase the competitive advantage (Nguyen & Gray, 2016). Sustainable buildings are reported as being the future for property increasing. Currently, Malaysia is also part of the countries that responds to this sustainable

practice. Malaysia is currently heading towards Vision 2020. The vision calls for the Malaysia to achieve a self-sufficient industrialised nation by the year 2020, encompasses all aspects of life, from economic prosperity, social well-being, educational world class, political stability as well as psychological balance. The government of Malaysia also has encouraged either public or private sector to develop green building project in order to promote sustainable development which has long term benefits.

According to Green Building Index website, until September 2019, there were 909 registered projects and from that total, 513 were being certified. For non-residential building, there were 487 registered projects and 265 had been certified by the GBI. There are quite a huge number of buildings that had been recognised as green building. However, the question is whether all these buildings have achieved the expectations of the users, as the primary occupiers of that building. Moreover, many researchers also agreed that the overall cost for constructing the green building is higher compare to the conventional building (Aliagha et al., 2013; Asdrubali et al., 2013; Dwaikat & Ali, 2016; Liu et al., 2014; Yu at al., 2015). Thus, it is essential to understand the occupier's perceptions and expectations of sustainable building design and technology incorporated in the building since the social aspect is a major principle of sustainability (Jailani et al., 2015). The good performance evidence showed when the green building is employed will attract another developer either from private or government agencies to invest in the green building project as it creates a lot of benefit not only to the user, client but also to sustain the environment.

The actual performance of the green building can be determined by carrying out the Post Occupancy Evaluation (POE). Nevertheless, this practice is still rare in Malaysia (Izran Sarrazin, 2011). This paper focussed on identifying the performance criteria and performance parameters of Post Occupancy Evaluation of the green building performances in Malaysia.

POST OCCUPANCY EVALUATION (POE)

There are various definitions of Post Occupancy Evaluation (POE) established by various scholars or institutions. Jaunzens et al., (2002) defined POE as an evaluation of seeking feedback on the performance of

an occupied building. Preiser et al. (1988) described POE as a systematic evaluation on the facility which is occupied by building occupants for a period, meets the anticipated organisational goals and building users' needs. POE is acknowledged as a process that can help to improve and enlighten the performance of the built environment (Kim, Oh, & Kim, 2013a).

Another definition of POE is by Izran and Hakim (2007). They defined POE as the formal evaluation of a building that focuses on user satisfaction, measured with social science-based tools of interviews, surveys, focus group, systematic observation and behavioural mapping in order to achieve continuous improvement throughout the building's life cycle. Public Work Department (2010) stated that POE is a process of evaluating building performance for at least twelve (12) months and is measured by seeking the building user's feedback. The assessments used can ensure the government buildings that have been designed and operated able to fulfil the building consumer needs with efficient operating cost, efficient maintenance and efficient life cycle.

BUILDING PERFORMANCE EVALUATION CRITERIA FOR GREEN BUILDING

According to Cliff and Butler (1995, as cited by Izran Sarrazin, 2011), building performance is the physical performance characteristics of building as a whole and its parts and about meeting the functions of its anticipated use (William, 1993, as cited by Izran Sarrazin, 2011). Due to the advancement of modern technology, business competitiveness and the level of education, the building performance has become more complex.

The building as aptly put by Douglas (1996) should perform well in term of adaptive (loose fit), durable (long life), energy efficient (low energy consumption); habitable (comfortable and healthy) and secure (stable and intruder-resistant) . For green building to perform well, it should provide satisfaction to the users no matter how complex the buildings are (Izran Sarrazin, 2011). For example, the users want the lighting sensors to function as its intended purpose upon entering the office.

According to Baird et.al (1996, as cited by Izran Sarrazin, 2011), building performance evaluation is systematic assessment of building performance in relation to its define objectives and requirements. In conducting building performance evaluation, it is essential to understand the occupants' need and the building functions (Izran Sarrazin, 2011). Thus, building performance is measured by determining how well the building supports the defined needs of its users.

Preiser (1995) had highlighted the importance of building performances;

1. For property portfolio review, acquisition or disposal purposes
2. To highlight where it is lacking in performance
3. To help prioritise maintenance or remodelling works
4. To provide identification or early warning of obsolescence in buildings
5. To support in achieving value for money from building assets by aiding identification of performance achievement as well as failure.

There are various methods recommended by the researchers to measure the building performance evaluation. One of the methods is a post occupancy evaluation (POE). According to Zimring and Reizenstein (1980), the concept of POE deals with evaluating the building performance and effectiveness of the aspects in a systematic manner. The findings of implementing POE can be used as recommendation to improve building performances so that it will meet their desired goals.

To identify the green building performance, building performance criteria will be used. Various researchers have established the criteria for the building performance evaluation criteria (Douglas, 1996). For instance, Newton (1994) listed nine (9) categorised in Building Quality, ISO 6241 listed 14 key performances and in ORBIT 2.1 listed 14 issues.

For Post Occupancy Evaluation (POE), Preiser et al., (1988) listed ten (10) performance criteria. Izran Sarrazin (2011) listed fifteen (15) performance criteria and thirty-seven (37) performance parameters. A total of fifteen (15) of the building performance criteria and thirty-seven (37) parameters were identified in the literature and need to be validated by the Green Building Facilitators from Green Building Index (GBI) and green building manager.

Health

The term 'healthy building' represents the impact that the building imposes to the building's occupiers. The issue of Sick Building Syndrome (SBS) has led to the increasing demand for buildings that are healthier to be occupied. According to Izran Sarrazin (2011),Ibrahim (2012), Nguyen and Gray (2016), Pei et al., (2015),Zhao et al., (2015), it is important to be aware on the health factor of a building. The health level of a building is represented by three parameters;

1. Indoor air quality (Izran Sarrazin, (2011); Altomonte and Schiavon (2013); Baird and Thompson (2012); Choi et al., (2012); Gou and Lau (2013); Jailani et.al (2015); Nguyen and Gray (2016); Paul and Taylor (2008); Pei et al., (2015); Reed and Jailani (2014); Zhao et al., (2015)
2. Building material (Izran Sarrazi (2011)
3. Lighting (Izran Sarrazin (2011); Baird and Thompson (2012); Choi et al., (2012); Jailani et al., (2015); Zhao et al., (2015)

Indoor Air Quality

Indoor air quality is about the condition of the air quality in the building. The health level of a building is largely attributed to its air quality, be it mechanical or natural (Izran Sarrazin, 2011). The quality of indoor air quality in the office can be affected by gases, microbial contaminants or any mass that can influence the user's health.

According to Izran Sarrazin (2011), due to the construction of buildings designed to be energy efficient with air conditioning system but poor in maintenance and services of Heating, Ventilation and Air Conditioning (HVAC) system will result in the increase of indoor air pollutants levels. As Malaysia is a tropical country, proper ventilation in a building is a must. Poor Indoor Air Quality (IAQ) will cause occupants to get symptoms like irritation of the eyes, nose, and throat, headaches, dizziness, and fatigue (Agency, 2016). Building Quality Assessment and Condition Surveys are among the building performance evaluation mechanism that consider indoor air quality as one of the parameters to be examined in order to determine how a building affects its occupants' level of health (Izran Sarrazin, 2011). Baird and Thompson (2012), Jailani et al., (2015), Kessler (2010), Pei et

al., (2015) stipulate that the indoor air quality is a criteria for sustainable office building that needs to be studied.

Building Material

Some of the building's materials are hazardous to the building user's health. Most paints and preservatives in building materials in building materials contain chemicals which are hazardous to health (headaches, dizziness and tiredness). According to Gregory Havel (2010 as cited by Chew, 2016), some common hazards of building materials can affect building users' health as shown in Table 1.0.

Table 1.0: Common Hazards of Building Materials and Effects

Building Material	Effect
Silica	Respiratory irritant and long-term exposure can cause chronic obstructive pulmonary disease (COPD)
Lead	Kidney, nervous system and another organ damage
Asbestos	Respiratory irritant, COPD and cancer
Polychlorinated biphenyls (PCBs)	An accumulative toxins and cause liver and skin problems, organ damage and other disease
Glass fibre	Eye, skin and respiratory irritant
Mineral wool	Eye, skin and respiratory irritant
Cadmium	Eye and skin irritant; long term exposure can cause cancer

Lighting

Lighting is one of the factors that can affect human health. In a building, lighting is an important element for the building occupants to have good and clear vision. Lighting can be natural (which direct from sunlight) and artificial (fluorescent light or light bulb). Bright and visual environmental quality can have a substantial impact on occupants' abilities to accomplish tasks (Baird & Thompson, 2012).

Safety

Buildings need to be safe. Any design team, facilities and building manager put the safety of their building as the main concern. Safety is the main concern because it is about user's safety and it involves human life. Besides, safety is a criteria that a building must have (Izran Sarrazin, 2011; Preiser (1988). There are four main parameters to determine safety level of a building:

1. Design (Izran Sarrazin, 2011)
2. Building Material (Izran Sarrazin, 2011)
3. Equipment (Izran Sarrazin, 2011)
4. Information (Izran Sarrazin, 2011)

Security

Security in the building is important for the building owner, its occupants and maintenance workers. A building either it is commercial or housing, furniture, confidential data will require certain level of security to protect their interest (Izran Sarrazin, 2011). The security criterion refers to the security level that a building provides for building users either it is indoor or around the buildings. The security level of a building is determined by three main parameters;

1. Design (Izran Sarrazin, 2011)
2. Lighting (Izran Sarrazin, 2011)
3. Security system (Izran Sarrazin, 2011)

Functionality

All buildings must function as it supposes to be. The functional building will enhance the productivity of the workers. All buildings have their own function and are designed to accommodate its respective purpose (Zagreus, 2005). The function of a building can be itemised based on various literature such as:

1. Design and planning (Izran Sarrazin, 2011)
2. Space Adequacy (Izran Sarrazin, 2011);(Zagreus, 2005)
3. Technology (Izran Sarrazin, 2011)
4. Facilities and Building Services (Izran Sarrazin, 2011; W. Preiser et al., 1988)

Design and Planning

A clear definition of the work activities needs to be clearly defined before starting the designing work. Designing and planning must align with the function of the building and need to understand the building owner's requirement (Izran Sarrazin, 2011). For example, in designing for green

building, furniture and equipment, layouts need to be considered to illustrate the function of each space. The reason is the shape will apparently influence the way it can be used. Thus, the design teams need to consider all furniture and equipment at the pre contract stage (design development stage) to ensure that the design shape provided fulfil its purpose.

Space Adequacy

Space adequacy can be referred to as the adequacy of the number of space and the size of the space. According to Izran Sarrazin (2011), it is vital for the design teams to identify the space needed for users activities and equipment. There is a possibility that it is likely to be inadequate to serve its purpose if there is insufficient of space for building users to carry out tasks within the building. For example, the space provided is sufficient for the building user to move around.

Technology

The technology used in the building like telecommunication, information technology must function as its intended purposes effectively and efficiently (Izran Sarrazin, 2011). The technology does not only need to function with minimal breakdown, but it also can be used effectively and efficiently. For example, the motion sensor for lighting purpose in the green building must function well as to promote energy efficiency.

Facilities and Building Services

The functionality of facilities and building services influence the task that occurs in the building. For example, the elevators need to function effectively and efficiently for high rise office building with minimal breakdown. Another example is as HVAC system plays an important role in providing comfort to the building user, and the HVAC system needs to function well (Izran Sarrazin, 2011).

Efficiency

An efficient building is a building that consumes efficient energy and water and make use of space efficiently (Izran Sarrazin, 2011). For green building itself, it is one of the main criteria that the green building needs

to achieve. The efficiency of a green building can be measured by three (3) parameters which are energy use, water consumption and space utilisation and planning.

Energy Efficiency

As building becomes complex nowadays, the consumption of energy is increasing year by year. Globally, buildings are responsible for roughly 40% of the total world annual energy consumption (Omer, 2008). Most of this energy is for lighting, heating, cooling and air conditioning. Thus, the awareness to conserve energy has led to the upbringing of green building that is environmentally friendly. Either it is, public building, commercial building or resident building, the assimilation of energy efficient characteristics are high in demand (Gou et al., (2013); Izran Sarrazi (2011); Nguyen & Gray, 2016; Zhao et al., 2015). According to Zhao et al.,(2015), the green building nowadays is becoming a trend in the community and the society has accepted it due to its energy efficient. As a result, it sustains the environment (Reed & Jailani, 2014).

Izran Sarrazin (2011) aptly puts that energy refers to electricity and since green buildings are equipped with numerous electric-generated equipment such as HVAC, alarm system, motion sensor and information technology, they can be considered as the single most 'energy-hungry' entity. A building is considered energy efficient if it delivers more services for the same energy input (Chew,2016).

Water Consumption

Water consumption is one of the aspects that need attention in the evaluation of a building's efficiency. According to Dkhar (2012), water consumption can be referred to as "using the best available technology and innovative ideas to achieve long-term water sustainability without scarifying quality of life". For example, in certain green office building, they are using rainwater harvesting systems for toilet use, watering plants inside the building and using basin pillar tap at toilet to reduce the water consumption. By practicing water efficiency, water supplies for future generations can be preserved, reduce water utility and sustain the environment.

Space Utilisation and Planning

Space in the building must be flexible, encourage productivity by being aesthetically pleasing, be comfortable and conducive to individual and group interaction. Space planning is the action of translating the space needed of an organisation onto the floor plates of a building and at the same time taking into account the defined adjacencies between business units.

Space efficiency indicates how well the space is apportioned as a component of the total space. According to Izran Sarrazin (2011), space efficiency measurements depend on the floor area and there are several ways to measure space and analyse the total area within a building. The provision of high ratio usable area to the building's gross built area is the key indicator for a space efficient building. This is commonly measured based on the floor area.

Social Needs

Buildings are built for human, the one who occupy and operate the premise. Human are social beings with social needs and the provision of social facilities influences the perception of the people towards an area, either a place to work, play or live (Izran Sarrazin, 2011).

Psychology

The effects that the architecture and physical design of a building do influence the mental response of the building users. For example, mood, communication pattern, interaction and work performance (Izran Sarrazin, 2011). The psychological consist of design and planning, lighting and colour.

Aesthetic

Aesthetics are the nature and expression of beauty. The design of the building does not only serve the functional aspect but also contribute to an attractive and inviting atmosphere (Izran Sarrazin, 2011). The aesthetics of building include the building shape, size, materials and the decoration. For example, the use of glass facade as exterior wall finishes in the green building will lead to modern look of the building. The building will look aesthetically pleasing from the outside view.

Operations and Maintenance

Building operations and maintenance is about all the services required in order to ensure the building is performed as intended. Building maintenance and operations normally consist of the daily necessary activities for the building and its system and equipment to perform their intended purpose (Izran Sarrazin, 2011). A building cannot serve its function at its optimal level without having maintenance.

Comfort

One of the most important criteria of building performance of green building is the comfort of building users. A building should provide a contented internal environment, in terms of:

1. Thermal comfort (Izran Sarrazin, 2011); (Zhao et al., 2015); (Gou et al., 2013); (Choi et al., 2012); (Altomonte & Schiavon, 2013); (Reed & Jailani, 2014);(Pei et al., 2015)
2. Visual comfort (Izran Sarrazin, 2011); (Zhao et al., 2015);(Pei et al., 2015)
3. Ergonomics (Izran Sarrazin, 2011).
4. Noise comfort (Izran Sarrazin, 2011); (Gou et al., 2013);(Pei et al., 2015)

Thermal Comfort

Thermal comfort is one of the most important performance parameters to be evaluated for the green building performance. Thermal comfort can be defined as "condition of mind which express satisfaction with the thermal environment" (ASHRAE, 2005, as cited by zran Sarrazin, 2011). Everyone has different degree of thermal comfort level. Thus, it is difficult to determine the degrees of thermal comfort level because of the different preference.

Lack of building performance evaluation about the thermal comfort may lead to the uneasiness of the occupants if the building is too hot or too cold (Gou et al., 2013). Evaluating thermal comfort however involves input from both the building users and experts in determining the most reasonable thermal comfort zone for a particular building. Hence, this illustrates the importance in allowing assessment of the building's comfort performance (Kessler, 2010; Pei et al., 2015).

Visual Comfort

In achieving visual comfort, the sufficiency of light is a must. Visual comfort is strongly affected by lighting, particularly daylight (Izran Sarrazin, 2011). Sufficient levels of lighting positively impact the performance of the occupants (Zhao et al., 2015). The visual comfort aspect of a building can be observed from the luminaire layout, type of lamp and their armature, window positions, building envelope, and shading device, brightness level, glare, view, inside and outside view and visual privacy (Izran Sarrazin, 2011).

Ergonomics

Ergonomics is about ensuring the environment within the work building fits the workers. According to Norashikin (2013), ergonomics is about "the design of the workplace, equipment, machine, tool, product, environment, and system, taking into consideration the human's physical, physiological, biomedical, and psychological capabilities as well as optimising the effectiveness and productivity of work systems, while assuring the safety, health and well-being of the workers. Buildings that are designed with proper ergonomics considerations enhance the workers to carry out their work efficiently with minimal stress and fatigue (Izran Sarrazin, 2011). The facility that is designed ergonomically will ensure that people are comfortable, productive and free from the risk of illness and injury.

Noise Comfort

Excessive noise exposure causes negative health impact to building users. The excessive noise may cause stress, headaches and hearing loss (Chew, 2016). The assessment of noise level in a building has to cover a number of aspects such as the source of the noise (indoor or outdoor), type of noise and insulation of the building (Izran Sarrazin, 2011). Building users play a vital role in identifying the type of noise that leads to discomfort towards the building users.

Durability

Durability can be defined as the resistance of building materials to weathering action, chemical attack, abrasion and other degradation processes (Merretz, 2009). It covers the durability of building materials and structure integrity. The durability of building materials and building structure is an important aspect of building performance.

Circulation

Circulation is about how people move and interact with a building. Circulation is an important aspect in a building as it assists the movement of people (Izran Sarrazin, 2011). There are two aspects that need to be considered when designing circulation within the building which are interface and way finding.

Building Economics

The building economics is about their ability to serve at the desired function cost effectively (Izran Sarrazin, 2011). A cost-effective building is the dream of every building owner. A cost-effective building is a building that has minimum operating and maintenance cost, has longest life span, inspires users to be productive and offers the greatest return on investment. Normally, the cost effectiveness of the green building is measured through the life cycle cost of the building. The life cycle cost of the building is about initial cost (construction cost), operating, maintaining, and disposing of the building (Khairani, 2011).

Culture

Culture is the systems of knowledge shared by a relatively large group of people (Karakowsky, 2001). A building is built for human to fulfil their needs and human is being governed by norm of life (Izran Sarrazin, 2011). Thus, understanding the culture can assist the design team in building design and planning. Although, the architecture community has long acknowledged the significance of culture in the design of buildings, it is limited only to interpreting visual form of culture such as colour, form, carvings and symbols.

RESEARCH METHODOLOGY

POEs can be implemented for various types and building from different eras. It is practicable to new building or building under renovations. Zimring and Reizenstein (1980) said most of the POE generally have five principle phases which are entry and initial data collection, designing the research goals, collecting data, analysing data and presenting information.

Meanwhile, Preiser (1995) said that the method in three progressive phases includes planning, conducting and applying. There are three steps in the planning phase namely; reconnaissance and feasibility, resource planning and research planning. The parameters for the POE project are created in this phase that consist of schedule, costs, manpower needs, plans for data collection procedures, times and amount.

Phase 1 of this research aims to achieve the first objective of this research which is to identify the performance criteria and parameters for Post-Occupancy Evaluation (POE) of green building in Malaysia. It consists of two (2) steps. First, a literature review regarding identification of the performance criteria and parameter that are recognised as important for POE of green building performance. A total of fifteen (15) building performance criteria and thirty–five (35) parameters were identified in the literature and the performance criteria and parameters were tested in a survey for validation (using Content Validity Index). Content validity is the degree to which an instrument has an appropriate sample of items for the construct being measured (Polit & Beck, 2006. as cited by Nadiah, 2016). Content validity was carried out to determine whether the content of the questionnaire is suitable and relevant for the purpose of this research (Nadiah, 2016). Content validity portrays the content that reflects a complete range of the attributes under study. The instrument must be clearly conceptualised. Besides, clear evidence of the operational components must be defined in order to obtain content validity.

Eight panels of expert were selected to validate the content of green building performance criteria and parameters. Content validity is usually carried out by seven or more experts (Parsian & Dunning, 2009). However, Yaghmaie (2003) said five to ten panels are appropriate, while more than 10 panels were probably unnecessary. The researcher adopted the criteria stated by Yun and Ulrich (2002) in selecting the experts for content validity. Panel of experts were selected based on their job title, experience, knowledge and availability to participate in the questionnaire within the stipulated time frame. For the purpose of this study, the researchers have decided to set several criteria in selecting the experts; Green Building Index (GBI) facilitators with over five (5) years of experience and building manager with over 5 years of experience. The guidelines adopted in selecting the experts in this research were based on Effendi et al., (2015) guideline which are:

1. Experienced building managers with over three years of experience.
2. Experienced green building facilitators with over three years of experience.

The outputs identify the variable performance criteria parameters of green building.

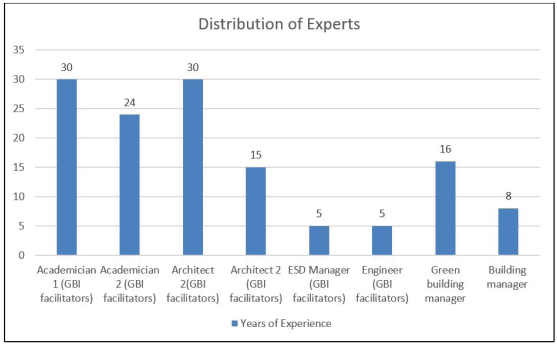

Figure 1 : Distribution of Experts
Source: Author

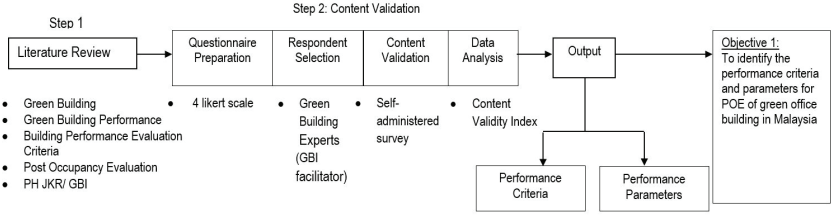

Figure 2: Research Methodology Diagram
Source: Author

DATA ANALYSIS

Each of the items (I-CVI) was calculated using Content Validity Indexing and the final average of the I-CVI scores produces a scale-level content validity score (S-CVI). Calculations for obtaining the CVI are shown in Figure three (3.0).

$$I - CVI = \frac{\text{The Number of Epxerts Giving a Rating of 3 and 4}}{\text{Total Number of Expert}}$$

$$pc = \left[\frac{[N!]}{[A!\,(N-A)!]}\right] \text{x o. } 5^{x}$$

$$k = \frac{I - CVI - pc}{1 - pc}$$

Figure 3.0: Formula for Content Validity Index

I-CVI = Item Content Validity Index
pc = Probability of Random Correlation Coefficient
N = Number of Experts
A = Number of Very Important Scores (3 or 4)
k = Modified Kappa Coefficient

RESULTS

Table 2.0: Result of Content Validity Index

Performance Criteria	Performance Parameters	I-CVI	pc	k	Rating
Health	1.1 Indoor Air Quality	1.00	0.00	1.00	Excellent
	1.2 Material	1.00	0.00	1.00	Excellent
	1.3 Lighting	1.00	0.00	1.00	Excellent
Safety	2.2 Equipment	0.88	0.03	0.87	Excellent
	2.3 Information	0.88	0.03	0.87	Excellent
	2.4 Building Material	0.88	0.03	0.87	Excellent
Security	3.1 Design	0.63	0.22	0.52	Poor
	3.2 Lighting	0.88	0.03	0.87	Excellent
	3.3 Security System	0.88	0.03	0.87	Excellent

Functionality	4.1 Design and Planning	0.88	0.03	0.87	Excellent
	4.2 Adequacy of Space	0.63	0.22	0.52	Poor
	4.3 Technology	0.88	0.03	0.87	Excellent
	4.4 Facilities and Building Services	1.00	0.00	1.00	Excellent
Efficiency	5.1 Energy Efficiency	1.00	0.00	1.00	Excellent
	5.2 Water Consumption	1.00	0.00	1.00	Excellent
	5.3 Space Utilisation and Planning	0.88	0.03	0.87	Excellent
Psychology	6.1 Design and Planning	0.88	0.03	0.87	Excellent
	6.2 Lighting	0.88	0.03	0.87	Excellent
	6.3 Colour	0.75	0.11	0.72	Poor
Social Needs	7.1 Social Space and Facilities	0.50	0.27	0.31	Poor
Aesthetics	8.1 Exteriors and Interiors	0.50	0.27	0.31	Poor
	8.1 Image	0.50	0.27	0.31	Poor
Maintainability	9.1 Design and Material	1.00	0.00	1.00	Excellent
Comfort	10.1 Thermal Comfort	1.00	0.00	1.00	Excellent
	10.2 Visual Comfort	1.00	0.00	1.00	Excellent
	10.3 Ergonomics	0.88	0.03	0.87	Excellent
	10.4 Noise Comfort	1.00	0.00	1.00	Excellent

Durability	11.1 Building Material	1.00	0.00	1.00	Excellent
	11.2 Structural Integrity	1.00	0.00	1.00	Excellent
Adaptability	12.1 Flexibility, Convertibility	0.88	0.03	0.87	Excellent
Building Economics	13.1 Life cycle cost	1.00	0.00	1.00	Excellent
Circulation	14.1 Interface	0.88	0.03	0.87	Excellent
	14.2 Way finding	0.63	0.22	0.52	Poor
Culture	15.1 Design and Planning	0.63	0.22	0.52	Poor

Source: Author

I-CVI: Item Content Validity Index;
pc: Probability of Random Agreement;
k: Modified Kappa Coefficient obtained by designing the relevant of agreements: Evaluation criteria of k: poor 0.39, weak = 0.40-0.59; good = 0.60-0.73; excellent 0.74 (Orts-cortés et al., 2013).

Table two (2.0) shows the minimum of I-CVI is 0.80 and the maximum is 1.00. The content validity index indicates that each item scores a modified kappa coefficient of more than 0.74, with a rating of excellent. This shows that all the items are acceptable for further analysis.

DISCUSSION

Based on the result, it shows that 11 performance criteria and 26 performance parameters can be used to measure the performance of the green building in Malaysia. Most of the performance criteria and performance parameters listed received excellent rating because most of the green building assessment found in Malaysia has similar requirements. The concept of Green building has been continually revised and its definition is commonly accepted as "providing people with healthy, applicable, efficient space and natural harmonious architecture with the maximum savings on resources (energy, land, water, materials), protection for the environment and reduced pollution throughout its whole lifecycle" (Doan et al., 2017,

page number). Green buildings are better for the environment as they generally are energy efficient, water conserving, and use environmentally friendly building materials. They also seem to have positive effects for the occupants, for example, "green" buildings are associated with a high workplace satisfaction and seem to have psychological and behavioural benefits (Lim, Hirning, Keumala, & Ghafar, 2017, page number).

Green building is always associated with the indoor air quality (Holmgren, Kabanshi, & Sörqvist, 2017; Kim, Oh, & Kim, 2013b). Thus, green building should give positive effect in term of high workplace satisfaction that contribute to psychological and behavioural benefits (Holmgren et al., 2017). Green building should also relate with environmental efficiency which lead to saving in energy cost (Holmgren et al., 2017). Moreover, through all the phases of building life span, environmentally friendly built environments should be associated with safety, security, wellbeing, convenience, reasonable cost and long term adaptability (Kim et al., 2013b). Satisfaction of these criteria achieves an optimal combination of environmental, social and economic values for buildings. In addition, 'work efficiency' is seeming as the most important criterion for intelligent building systems. In particular, 'reliability' and 'operating and maintenance costs' are the crucial factors in selecting intelligent building systems.

CONCLUSION

The first objective of this research is to identify the variable performance criteria and parameters for Post-Occupancy Evaluation (POE) of green building in Malaysia. The first objective is achieved through Phase 1. This is the fundamental objective of this research. A total of 15 building performance criteria and 35 parameters were identified from the literature and were validated by green building facilitators and green building managers. For this study, 11 performance criteria and 26 performance parameters were selected from the outcome of Content Validation Survey.

The established performance criteria and parameters have been collectively agreed upon and confirmed to be applicable for green building. Thus, various parameters for the performance are important in order to achieve an in-depth understanding of the building performance of green

building. Different performance criteria have different parameters, and this encourages a better auditing of the green building.

This research is conducted to deliver a better understanding to any related parties who are involved in the development of green building. Moreover, finding obtained can be used as a guideline for the parties involved to design and develop a sustainable building that can give benefit not only to the users but also to the environment.

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