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Correlation Analysis of Occupants’ Satisfaction and Safety Performance Level in Low Cost Housing

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Abstract

The general building conditions in low cost housing are part of human’s quality indicator. However, there are rising issues on the safety performance of the housing since the occupants are inclined to perceive safety hazards. Therefore, this paper explores the concept of Post Occupancy Evaluation (POE) as safety performance tool. This research conducted a survey on safety performance and occupants’ satisfaction to 24 numbers of low cost housing at Kuala Lumpur, Malaysia. The correlation result shows that safety performance has a significant relationship with occupants’ satisfaction. The findings supported the application of POE as the tool for safety performance.

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1. Introduction

Housing is a foremost universal concern as the wellbeing of a country reflects in its people enjoying a particular standard of living. Residential and neighbourhood satisfactions are important indicators of housing quality and condition which affect individuals’ quality of life (Idrus & Ho, 2008). The factors, which determine their satisfaction levels, are essential inputs in monitoring the success of housing policies. Malaysia is going through a rapid process of population growth and urbanization for several

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years now. As announced through the Seventh Malaysia's Plan (1996-2000) to Ninth Malaysia's Plan (2006-2010), there is the emergence in low-cost housing construction which is an intentional act as an approach to eradicate squatters or illegal residential, especially in the Klang Valley area. It is inevitable that the Government encourages cooperative housing not only for the lower income groups, but it also caters for the middle-low income groups. Seeing the wavering economic situation, the emerging problem in housing property is the growing demand for better and safe housing. Therefore, it is increasingly important to evaluate housing property for many reasons.

Goh and Ahmad (2012) accentuated that the Human Rights Commission of Malaysia in 2003 criticised the Malaysian government on the failure in addressing issues that relate to the physical safety of occupants. There are also other issues, which were not in-depth consideration such as the habitability, suitability, lack of maintenance, defects and shoddy workmanship in low cost housings. It needs to be set forth that poor quality of a building is much allied to the safety failures of building. This assertion is supported by Abdul-Rahman et al., (1999) and Yau (2006) that indefensible buildings with poor workmanship and low quality of materials also lead to building deterioration and poor aesthetical performance. Poor quality and workmanship of a building will worsen the building if it is left unattended and the absence of maintenance action will instigate further impairment (Husin et al., 2012). As a result, the building is considered as unsafe due to the inferior quality condition. Despite enforcement of Construction Industry Standard 1 (CIS1, 1998) and Construction Industry Standard 2 (CIS2, 1998), regulatory measures, there are still many safety problems faced by low cost occupants in Malaysia.

Stevenson & Leaman (2010) suggested that the evaluation of user perceptions and behaviour in relation to building performance in housing is an emerging research area. The review of literature by Yau (2006) suggested that studies on housing safety should focus on the epidemiological relationship between the living built environment and safety hazards. Therefore, the assessment of safety in low-cost housing is highly relates to the users' behaviour and occupants' feedback. The present research acknowledges Post Occupancy Evaluation (POE) as the best tool to examine the safety performance in low cost housing. Many previous researches (Khalil & Nawawi, 2008; Mumovic et al. 2009; Hassanain, 2007; Liu, 2003; Minami, 2007; Altas & Ozsoy, 1998; Collet da Graca et al., 2007; Gill et al., 2010; Amaratunga & Baldry, 1999; Foxall & Hackett, 1994; Goh & Ahmad, 2012) have showed significant results in optimizing the performance of building by applying POE as the research tool.

2. Post Occupancy Evaluation (POE) as safety performance tool

Leaman et al. (2010) described that buildings are self-evidently settings or 'contexts' for human activities. The importance of safety performance assessment in Malaysian low cost housing is typically the criteria for judgement in the fulfilment of the functional and the occupants' needs. Aptly, the impact of strategies in dealing with the safety issues based on the building occupants' experiences needs to be measured. Such assessment is reliable by adopting Post Occupancy Evaluation (POE) as the approach and the best tool to assess safety performance in low cost housing. POE has emerged as a strategic performance measurement tool that is able to examine building performance after the building handed over to the occupants. Regrettably, Way & Bordass (2005) identified that the post-construction stage of a building is the most neglected stage, and it is often looked upon as a nuisance and a distraction. POE encompasses a comprehensive review of the building details covering the technical performance, users' satisfactions, project delivery process and recommendation for the action.

Many agencies, especially in developed countries such as the UK, USA, Canada and Australia, are using information from POE in support of the design criteria and guidelines. POE programmes were conducted after construction stage to identify mistakes and lessons learned by analysis of findings. To ensure the success of building performance aspects, the roles and responsibilities of building stakeholders

must be congealed to highlight any gaps and possibly the unsuitability of individuals in their assumed roles (Way & Bordass, 2005). Subsequently, the framework involving roles, objective, phases of application and issue to address in conducting the POE for a building must be encoded to attain positive results from such assessment. In general, based on some literature, (Darkwa, 2006; Donn, Selkowitz, & Bordass, 2012; Preiser et al., 1998; Preiser & Nasar, 2008; Preiser, 2001; Vischer, 2002; Watson, 2003), the phases of POE consist of three (3) vital phases, namely; *Planning phase*, *Conducting phase*, and *Applying phase*. These vital phases are necessary to be implemented in any survey instrument in evaluating various building performance aspects.

2.1. The fundamental concept: Building users/occupants' feedback

The primary concept and process in POE is to illustrate significant considerations for the evaluation to ensure the accuracy in the method used. The main considerations of the POE criteria are to define the case study or building and the inputs needed from the building users, i.e. their feedback. The criteria for judgement are the fulfilment of the occupants' needs that POE is focusing on assessment of client's satisfaction and functional 'fit' (Zimmerman & Martin, 2001). Building construction will develop prototypes that need follow-up through the lesson and feedback. Way and Bordass (2005) described that POE has its part to play and helps create the understanding of where things fall short of expectations, but it is inherently retrospective. Therefore, the fundamental concepts of POE stress the importance of feedback data from the building users. However, Bordass and Leaman, (2005a) believed that data and knowledge management tend to be relatively weak in most building-related organizations. Consequently, the project management team would decide to give their concentration on immediate clients as the team would be able to put their experience and a new understanding into action immediately (Bordass & Leaman, 2005a).

There were many instruments that can be utilised in gathering feedbacks from building users including individual surveys, focus groups, interviews and users' satisfaction surveys (Bordass & Leaman, 2005a; Eley, 2001; Watson, 1996; Watson, 2003). All of the results provide beneficial information to fulfil the main objective of conducting the POE as identified in the early stage of assessment. Feedback is beneficial in POE when the building considers being the product (Eley, 2001) and when the building players involve the owner/client, the users, the designers and the construction and products industries in the survey. Seeing this importance, assessing safety in building evaluation is fundamentally proactive in measuring performance and acting upon the information gathered. As POE studies emphasize the importance of feedback from the users, hence, their satisfaction is measures towards improving raising current issues in the said building. Chohan et. al., (2010) linked the relationship of users' satisfaction with architectural aspects of housing revealing that most researchers are unanimous on the importance of addressing emerging issues of faulty design, maintenance and users satisfaction. The concept of POE in getting feedback from the users helps to feed the inputs into the completed project and much can be learnt for reuse in future studies (Khalil, Husin, & Nawawi, 2012). However, for the most part, building users have not engaged directly with the performance of the end product. Building stakeholders must aware to the concept of POE as this tool able to provide extensive benefits that can maintain the sustainability of the building, including the safety aspects.

3. Research objectives

The main aim of this research is to develop a Post Occupancy Evaluation (POE) framework that integrates safety elements for low cost housing (LCH) in Malaysia. The research objectives are as follows:

- To identify the concept of Post Occupancy Evaluation (POE) in relation to safety performance
- To identify the safety elements and attributes in low cost housing
- To determine the correlation between the level of safety performance attributes and the occupants' satisfaction level

4. Methodology

This study employs the mixed-method approach; using both qualitative and quantitative analysis. It begins with preliminary survey stage, where the questionnaire survey and semi-structured interviews is used as instrument, to the building experts. The experts are professionals that working in organizations involving PPR housing development management, including from KPKT, DBKL, CIDB and also professionals builders in private construction firms. Result and findings from preliminary survey has confirmed the suitability of the construct safety elements and attributes. The list safety elements and attributes are then included in the survey forms for Main Survey, i.e. Safety Performance Inspection Survey (SPIS) and Occupants Satisfaction Survey (OSS).

The main objective of SPIS is to obtain the safety performance score of the attributes using numerated performance scale, via condition inspection to the housing area. The inspection survey divides into two (2) sections; Section A: Housing Background and Details, and Section B: Safety Performance Inspection Checklist. While the OSS is use to determine occupants' satisfaction level of the validated safety attributes and distributed the questionnaires to the identified occupants. The questionnaire initially records the name of building; dividing into three sections, namely; Section A: Demographic Information, Section B: Occupants' Satisfaction Level, and Section C: Perception on the Necessity of Housing. However, the discussions in this paper only provide the results on Section B for both SPS and OSS. Utilizing the five points Likert-scale, the respondents were need to respond to each statement in the questionnaire within five degrees of satisfaction. The correlation test between safety performance and occupants' satisfaction is to identify whether there is a significant relationship between the safety performance and the occupants' satisfaction level.

Both variables in SPS and OSS consist of ordinal scale; therefore, it is suitable to use Spearman rho (r) correlation as statistical analysis.

5. Analysis and findings

The analysis of the main survey entails into three parts; i.e. i) Result of Safety Performance Survey, ii) Result of Occupants' Satisfaction Survey, and iii) Correlation Result of Safety Performance and Occupants Satisfaction. The first part describes the analysis of safety performance level for each safety attributes. The inspection survey is carried out by nominated and reliable professional surveyors. The second part of the analysis reveals the level of occupants' satisfaction towards the safety attributes. Finally, the last part of this analysis reveals the findings of correlation between the safety performance scale and the occupants' satisfaction level, based on the similar safety attributes for the sample of housing units. Both surveys have similar sample size, which is 380 of housing samples, and 380 respondents representing the occupants of twenty-four (24) low cost housing area namely *Projek Perumahan Rakyat* (PPR) (see Table 1). PPR is located in the Federal Territory of Kuala Lumpur, and it is a Government program to accommodate and meet the needs of all slum dwellings for low-income earners. The National Housing Department (JPN), alongside the Ministry of Housing and Local government are the implementing agencies for PPR projects across Malaysia. Most of the PPR tenants opt for the rental basis with only a segment of the tenants bought and own the units. Kuala Lumpur is the capital and the largest

city of Malaysia covering a land area of 244 sq km (94 sq mi), with a population of 1.63 million according to census projections in 2010 (Junaidi, Fauzi, & Ghazali, 2012).

Table 1. Information of Program Perumahan Rakyat (PPR) housing projects (housing samples)

NO.	HOUSING PROJECTS	TOTAL NO. OF UNIT	TOTAL NO. OF BLOCK	DATE OF HAND-OVER	SAMPLE SIZE (s)
ZONE 1					
1	PPR Kg. Muhibbah, Jalan Puchong	2,844	9	22.12.2006	20
2	PPR Malaysia Permai (PPR Raya Permai)	1,264	4	2.06.2006	20
3	PPR Sg. Besi (PPR Desa Petaling)	632	2	19.08.2002	10
4	PPR Pudu Hulu	948	3	15.01.2003	20
5	PPR Seri Malaysia	632	2	03.1.2007	10
6	PPR Jln. Lapangan Terbang Lama Fasa 1 (PPR Seri Alam)	660	5	29.04.2004	20
7	PPR Jln Cochrane (PPR Laksamana & PPR Perkasa)	1,620	5	25.04.2005	20
8	PPR Jln. Lapangan Terbang Lama Fasa 2 (PPR Seri Alam 2)	920	7	12.07.2010	20
ZONE 2					
9	PPR KL Linear City 1 (PPR Seri Anggerik)	316	1	15.01.2003	10
10	PPR KL Linear City Ii Fasa 1 (PPR Pantai Ria)	1,264	4	08.08.2007	20
11	PPR Lembah Pantai, Kerinchi	1,896	6	31.3.2007	20
12	PPR KL Linear City Ii Fasa 2 (PPR Seri Cempaka)	632	2	08.08.2007	10
13	PPR Salak Selatan	632	2	24.06.2004	10
14	PPR Kg. Limau, Pantai Dalam	632	2	15.1.2005	10
ZONE 3					
15	PPR Taman Intan Baiduri	1,834	6	15.04.2004	20
16	PPR Taman Wahyu I (PPR Beringin)	1,896	6	31.03.2003	20
17	PPR Pekan Batu	632	2	03.12.2002	10
18	PPR Taman Wahyu II (PPR Wahyu)	948	3	07.04.2002	20
19	PPR Kg Batu Muda (SPNB)	2,132	7	31.12.2006	20
20	PPR Pekan Kepong	948	3	08.04.2010	10
ZONE 4					
21	PPR Ampang Hilir (PPR Hiliran Ampang)	948	3	16.12.2004	10
22	PPR Kg. Baru Air Panas	2,528	8	1.05.2007	20
23	PPR Sg. Bonus, Air Jernih	632	2	14.02.2005	10
24	PPR Seri Semarak	1,580	5	14.02.2005	20
TOTAL		28,970	99	-	380

Based on Table 1, the housing projects were hand over to the tenants beginning 2002 to 2010. Therefore, the occupancy period of the housing range from 2 years to 10 years. The sample size determined for this research is using the formula by Krejcie and Morgan (1970). The sample size included in both surveys (housing units and building occupants) is 380 samples.

5.1. Results on safety performance survey

In this section, each attribute derived from the results of preliminary survey is use for the safety performance inspection in the identified building. There are 24 safety attributes listed in the survey form, and the rating of each attribute in the relative safety elements refers to the scale value of Safety Performance Index (SPI). The constructed SPI is adapt from previous schemes; CSP1Matrix (Che-Ani et al., 2010) and Housing Performance Evaluation Model (HPEM) (Kim et al., 2005). Prior to carrying out the survey, the above constructive SPI was forwarded to professional assessors for review. During the

review, the professional assessors agreed on the reliability of the SPI since it was developed and tested in previous studies. Professional assessors also provide a letter confirming on the reliability of the SPI; for record purposes. Table 2 illustrates the result of safety performance level for the construct safety attributes:

Table 2. Descriptive result of safety performance level of all attributes

CATEGORY	ELEMENTS	ATTRIBUTES	SCALE OF SAFETY PERFORMANCE INDEX (SPI)				
			Very poor	Poor	Moderate	Good	Very Good
Performance	Structural	Column / beam	0%	4%	26%	68%	1%
		Roof	0%	6%	29%	65%	0%
		Slabs	0%	10%	40%	49%	0%
	Services	Electrical Services	0%	39%	23%	37%	0%
		Plumbing System	0%	10%	29%	61%	0%
		Fire System	0%	24%	52%	24%	0%
	Space	Corridor	0%	3%	66%	31%	0%
		Staircase	0%	19%	59%	22%	0%
		Balcony	0%	13%	65%	22%	0%
	Amenities	Playground	1%	20%	61%	18%	0%
		Vehicle Parking	3%	26%	57%	14%	0%
		Lift	23%	66%	8%	3%	0%
Quality	Fittings	Door / Window	0%	9%	16%	74%	0%
		Security bar /grille	0%	2%	21%	77%	0%
		Sanitary Fittings	0%	16%	26%	58%	0%
	Materials	Floor Finishes	0%	12%	48%	39%	2%
		Wall Finishes	0%	13%	48%	37%	2%
		Ceiling Finishes	2%	34%	36%	27%	1%
	Environment	Internal Ventilation	0%	6%	59%	35%	0%
		Indoor Temperature	0%	15%	43%	42%	0%
		Visual Obstruction	0%	18%	47%	34%	0%
	Workmanship	Plastering Works	0%	17%	48%	35%	0%
		Tiling Works	0%	9%	51%	41%	0%
		Painting Works	0%	17%	61%	23%	0%

Table 2 depicts the result of safety performance level for all samples of housing units demonstrating the results for Attributes under Performance as safety category. The professional building assessors rated the scale of safety performance during the safety inspection survey. Based on the result, the rating for several items as “good” performance are; column/beam (68%), roof (65%), slabs (49%) and plumbing system (61%). The scale ratings as “moderate” performance are fire system (52%), corridor (66%), staircase (59%), balcony (65%), playground (61%), and vehicle parking (57%). Two items were highly marked as “poor” performance; electrical services (39%) and lift (66%). For the safety category of Quality, the result presents that all attributes under the Fittings elements are highly rated as “good” performance; i.e. door/window (74%), security /metal grille (77%) and, sanitary fitting (58%). The rest of the attributes under this quality category were substantially rate as “moderate” performance. It describes that these items have moderate defects but may become severe if left unattended. Even though a majority of the items under this category are within moderate performance, this supports the probable change for the users’ requirements. The next analysis presents results of the occupants’ satisfaction level for similar attributes as investigated in the safety inspection survey.

5.2. Results on Occupants' Satisfaction Survey

Section B of the questionnaire requires the respondents to rate their satisfaction level for 24 safety attributes; under the Performance and Quality as the safety category. The safety attributes are similar to the attributes outlined in the safety performance survey (SPS). The respondents were need to rate their satisfaction level based on five numerical Likert-scale; "1" (Very dissatisfied), "2" (Dissatisfied), "3" (Moderately satisfied), "4" (Satisfied), and "5" (Very satisfied). Table 3 illustrates the occupants' satisfaction level towards the listed safety attributes:

Table 3. Descriptive Result of Occupants' Satisfaction Level

Safety Elements	Safety Attributes	Percentage Result For Occupants' Satisfaction Level					Missing/ No answer
		Very Dissatisfied (1)	Dissatisfied (2)	Moderately Satisfied (3)	Satisfied (4)	Very Satisfied (5)	
Structural	Column / beam	0.5%	6.1%	29.5%	60.5%	2.6%	0.8%
	Roof	0.3%	7.1%	30.8%	59.2%	1.6%	1.1%
	Slabs	0.5%	8.7%	38.7%	48.2%	2.4%	1.6%
Services	Electrical Services	0.5%	33.2%	25.5%	37.9%	2.1%	0.8%
	Plumbing System	1.6%	12.4%	28.9%	54.7%	1.6%	0.8%
	Fire System	0.5%	20.5%	47.4%	29.7%	1.1%	0.8%
Space	Corridor	0.5%	7.1%	59.5%	30.8%	0.8%	1.3%
	Staircase	1.1%	20.3%	53.7%	23.2%	0.0%	1.8%
	Balcony	0.8%	13.2%	58.4%	24.5%	0.5%	2.6%
Amenities	Playground	4.7%	23.9%	53.4%	15.8%	1.3%	0.8%
	Vehicle Parking	1.8%	13.7%	53.4%	28.2%	1.1%	1.8%
	Lift	18.7%	62.1%	13.4%	3.7%	0.8%	1.3%
Fittings	Door / Window	0.5%	10.0%	23.4%	64.7%	0.8%	0.5%
	Security bar / Metal grille	1.3%	5.3%	24.2%	67.4%	1.8%	-
	Sanitary Fittings	0.3%	15.0%	30.8%	53.2%	0.8%	-
Materials	Floor Finishes	0.5%	10.3%	49.5%	37.9%	1.8%	-
	Wall Finishes	0.5%	11.8%	46.3%	39.5%	1.6%	0.3%
	Ceiling Finishes	1.8%	22.1%	40.8%	33.7%	1.3%	0.3%
Environment	Internal Ventilation	1.3%	7.1%	55.0%	35.8%	0.5%	0.3%
	Indoor Temperature	0.5%	15.0%	40.8%	42.4%	0.5%	0.8%
	Visual Obstruction	0.8%	21.1%	42.6%	33.2%	1.8%	0.5%
Workmanship	Plastering Works	1.3%	12.4%	48.7%	34.7%	0.5%	2.4%
	Tiling Works	0.5%	10.3%	50.0%	36.8%	1.3%	1.1%
	Painting Works	0.5%	16.1%	54.7%	27.1%	0.8%	0.8%

Results from Table 3 indicate a higher proportion of satisfied respondents in attributes of *Column/beam, Roof, Slabs, Electrical services and Plumbing system*. However, 47.4% respondents (179 out of 380 respondents) are moderately satisfied with the *Fire system*. Additionally, it shows that more than 50% of the respondents are moderately satisfied for the attributes of *Corridor, Staircase, Balcony, Playground, and Vehicle Parking*. It is worthy to highlight that, 80.80% of the respondents (a total from 62.1% of dissatisfied and 18.7% of very dissatisfied respondents) had expressed their dissatisfaction with *Lift*. The respondents claimed that their dissatisfaction with the performance of the lift is due to regularly not functioning well and experience frequent break down. Results in Table 3 also illustrate *Security Bar/Metal Grille* receives the highest proportion of satisfied respondents as compared to *Door/Window*

(64.7%), *Sanitary Fittings* (53.2%) and *Indoor temperature* (42.4%). There are eight attributes, which the respondents, are moderately satisfied with; *Floor Finishes, Wall Finishes, Ceiling Finishes, Internal Ventilation, Visual Obstruction, Plastering Works, Tiling Works, and Painting Works*. None of the attributes under this quality category constitutes a major proportion of dissatisfaction from the respondents.

5.3. Correlation Result of Safety Performance and Occupants’ Satisfaction

The final section of the analysis illustrates the correlation between Safety Performance Scale and Occupants’ Satisfaction Level. The Spearman rho (r) is use in the analysis since both variables consist of ordinal scales derived from random sampling of housing units and respondents. The correlation test conducts to investigate whether there is a significant relationship between the safety performance level and the occupants’ satisfaction level with similar safety attributes. This provides the reliability of using POE as the benchmark of safety performance assessment in the low cost housing. The research hypothesis and the null hypothesis of the study are as followed:

- H_1 = there is a significant relationship between the safety performance of the low cost housing, and the occupants’ satisfaction with regards to the safety performance.
- H_0 = there is no relationship between the safety performance of the low cost housing, and the occupants’ satisfaction with regards to the safety performance.

According to (Chua, 2008), the result from the Spearman correlation shows the strength of the relationship of two variables by referring to its correlation coefficient value of spearman rho (r). The significance level of the variables is tested with two-tailed with a significant correlation value at .01 level (2-tailed). The correlation analysis was reported in two divisions of safety categories namely; performance category and quality category. There are twelve safety attributes under each category validated from the preliminary survey. The analysis of the correlation is using statistical software program SPSS (Statistical Packages for the Social Sciences, versions 16.00). The hypotheses were statistically test with a two-tailed alpha level of 0.05.

Table 4. Correlation result of Safety performance and Occupants’ Satisfaction (Performance category)

Attributes for Safety Performance	Column / Beam	Roof	Slabs	Electrical services	Plumbing system	Fire system	Corridor	Staircase	Balcony	Play ground	Vehicle parking	Lift
Correlation Coefficient	.662**	.714**	.670**	.633**	.625**	.703**	.624**	.645**	.647**	.493**	.297**	.434**
Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Attributes for Occupants' Satisfaction	Column / Beam	Roof	Slabs	Electrical services	Plumbing system	Fire system	Corridor	Staircase	Balcony	Play ground	Vehicle parking	Lift

Table 5. Correlation result of Safety performance and Occupants’ Satisfaction (Quality category)

Attributes for Safety Performance	Door / Window	Security bar / Metal grille	Sanitary Fittings	Floor Fin.	Wall Fin.	Ceiling Fin.	Internal Vent.	Indoor Temp.	Visual Obstruction	Plastering Works	Tiling Works	Painting Works
Correlation Coefficient	.592**	.595**	.722**	.664**	.682**	.581**	.689**	.654**	.682**	.652**	.657**	.703**
Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Attributes for Occupants' Satisfaction	Door / Window	Security bar / Metal grille	Sanitary Fittings	Floor Fin.	Wall Fin.	Ceiling Fin.	Internal Vent.	Indoor Temp.	Visual Obstruction	Plastering Works	Tiling Works	Painting Works

Table 4 and Table 5 show the results of Spearman correlation test between Safety Performance Level and Occupants' Satisfaction Level as the tested variables. It shows that a majority of the attributes of occupants' satisfaction level is positively correlates with safety performance level in the housing unit. For the Performance category (see Table 4), the correlation coefficient of the attributes indicates an average and strong correlational value. The highest correlation coefficient indicated for the attribute is *Roof*, with a significant value of $r = 0.714$. The categorization of attributes as "average" strength are; *Column/Beam, Slabs, Electrical services, Plumbing system, Fire system, Corridor, Staircase* and *Balcony*, with coefficient range from 0.624 to 0.703. All of the variables has a significant relationship (Sig.=0.000), even though some of the variables has a weak correlation strength (*Playground*, $r=0.493$, *Vehicle Parking*, $r=0.297$, *Lift*, $r=0.434$). Despite having weak correlation, these attributes have very significant relationships and supported the research hypothesis. It also illustrates that the null hypothesis was successfully rejected, and this research decides that there is a significant relationship between the attributes for both variables. Almost similar to the result as in Performance category, majority of the attributes in Quality category (see Table 5) is positively correlates with safety performance level. In terms of correlational strength, only the variable of *Sanitary Fittings* has a strong relationship, with $r=0.722$. The rest of the attributes, i.e. *Door / window, Security bar / metal grille, Floor finishes, Wall finishes, Ceiling finishes, Internal ventilation, Indoor temperature, Visual obstruction, Plastering works, Tiling works* and *Painting work*, were categorized as average strength with coefficient values ranging from 0.582 to 0.703.

Despite the findings resulted a moderate correlational strength, it was found that all of the variables have a significant relationship (Sig.=.000). The lowest correlation coefficient indicated based on the result is *Ceiling Finishes*, with $r = 0.581$. This result has lucratively rejects the null hypothesis. Therefore, there is a significant relationship between the two variables; hence this result supports the research hypothesis. Both results in the above correlational analysis show significant relationships between both variables, i.e. safety performance level and occupants' satisfaction level. Since the correlation result only provides the value of coefficient and the strength of relationship, predictions against the causes and the consequences have to be defined from the analysis. The researcher predicts that the level of occupants' satisfaction depends upon the level of safety performance in their housing unit. This correlation result is vital to glimpse the effectiveness of Post Occupancy Evaluation (POE) as the tool of assessing the performance of safety in low cost housing. The convincing correlational results confirmed the relevance of POE as the safety performance tool for this study.

6. Conclusion

The correlation analysis resolves to support the application of Post Occupancy Evaluation (POE) as the tool for safety performance assessment of low cost housing. Since POE grants the participations from the building users or building occupants as the assessment's execution, the relationship between the result of the safety conditions and the occupants' satisfaction validates the theoretical basis of POE as the safety assessment. The analysis has used strategic approach to achieve the best quality in building services, whereby the assessment integrates the occupants' behavior, perception and opinion as the building user. The correlational results from both surveys; SPS and OSS also support the research hypothesis crutching up the application of POE as the adopted assessment tool. All of the surveys and presentation of results were aligned with the vital phases being highlighted in POE concept; planning phase, conducting phase and applying phase. Therefore, the findings show that that the level of occupants' satisfaction depends upon the level of safety performance in their housing unit. Indirectly, it also shows the relevance of POE by incorporating participation of occupants, as the safety performance tool for this study.

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