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DESIGN FACTORS INFLUENCING SATISFACTION IN MEDIUM-RISE LOW-COST PUBLIC HOUSING

Azrina Md Yaakob^{1*}, Filzani Illia Ibrahim¹

¹ *School of Architecture, Building and Design,*
TAYLOR'S UNIVERSITY, SUBANG JAYA 47100, MALAYSIA

Abstract

Rapid urbanisation in Malaysia has increased reliance on low-cost public housing, particularly in urbanised states such as Selangor. Despite expanded provision, many medium-rise low-cost housing developments continue to adopt outdated design approaches that inadequately address residents' contemporary needs. Persistent issues such as overcrowding, poor spatial configuration, substandard materials, limited facilities, and weak environmental performance have contributed to growing dissatisfaction among residents. However, empirical evidence on how specific design factors influence resident satisfaction in Malaysian low-cost public housing remains limited. This study examines the design factors influencing resident satisfaction in medium-rise low-cost public housing using a quantitative approach. Quantitative data was collected through structured questionnaires administered to residents across selected housing schemes in the Klang Valley and analysed using SPSS and SmartPLS. The results reveal that physical design attributes particularly spatial layout, product quality, community development, and facility provision are the strongest predictors of resident satisfaction, while broader social initiatives show limited influence in the absence of sound physical design. The study highlights the importance of prioritising design quality in low-cost public housing and provides evidence-based insights to support more responsive, satisfaction-oriented housing design strategies in Malaysia.

Keywords: Low-cost, public housing, housing design, satisfaction

¹ Corresponding author. Email: azrina.mdyaakob@taylors.edu.my

INTRODUCTION

The issue of low-cost public housing has become so prevalent not only in Malaysia but also globally, including in Indonesia, Australia, and the United States of America (USA). Accordingly, the Malaysian government has initiated the 11th Malaysian Plan. It aims to increase access to affordable housing for targeted groups, strengthen planning and implementation for better management of low-cost public housing, and encourage environment-friendly facilities to enhance livability. Past researchers highlighted that the global issues and challenges in the development of public housing are financial issues in building low-cost public housing and poor maintenance of the low-cost public housing (Dzulkalnine et al., 2022).

However, one of the primary barriers facing the low-cost public housing industry is the poor construction quality and design of residential properties. A significant number of developers have yet to fulfil the minimum standard of criteria and indirectly have brought out the dissatisfaction of residents. The criteria involved include adequate space, basic facilities and overall building quality, which are essential to ensuring livable conditions for residents in low-cost public housing developments (Wan Mohamad, Ridzuan, & Abd Rahman, 2018). Beyond environmental and spatial deficiencies, poor construction quality and outdated housing design remain persistent challenges in low-cost public housing. Many developments fail to meet minimum standards relating to spatial adequacy, basic facilities, and overall building quality, thereby undermining livability and long-term housing performance (Wan Mohamad et al., 2018). While government-led low-cost housing initiatives have succeeded in improving housing access, unresolved design and quality issues continue to limit their effectiveness in enhancing residents' quality of life (Wahi et al., 2018). These conditions highlight the need for a systematic examination of how housing design factors influence quality of life outcomes in low-cost public housing developments.

The main factor that contributes to the success of the housing program conducted by the government is whether the housing conditions and facilities meet the demands and expectations of the residents (Wahi, Mohamad Zin, et al., 2018).

As cited by Wan Mohamad et al. (2018), in Malaysia, housing development is one of the prominent sectors in the construction industry. Since the quality of housing significantly affects the environmental, economic, and social dimensions, serious attention needs to be paid to it. Thus, the government must delineate a proper housing strategy that focuses on the design quality aspect of the housing. This housing strategy supposedly encompasses all income levels, especially low-income groups, in getting adequate and quality housing.

One of the challenges faced by planners, developers, policymakers and all those involved in the process of low-cost public housing is determining the

characteristics or parameters that will influence residents' happiness with their housing (Gopikrishnan & Paul, 2018).

LITERATURE REVIEW

Factors of low-cost public housing design on residents' satisfaction

According to Oladapo (2006), a house that is adequate from an engineering or design standpoint may not be adequate or satisfying from a resident's perspective. Thus, the ideal home element includes the physical, architectural, and technical engineering elements of the home. It also considers the residents' social, behavioral, cultural, and personal characteristics, as well as the home's management environment.

According to Fatt et. al. (2021), old low-cost public housing designs typically lack modern amenities that enhance the quality of life, such as proper ventilation, green spaces, or energy-efficient systems. Without new units being built to modern standards, residents in older developments may have to deal with poor living conditions, such as inadequate ventilation, lighting, or thermal comfort. Many older low-cost housing units were constructed under previous UBBL iterations, which may not have emphasized modern sustainability and livability aspects. For example, early public housing projects prioritized density over comfort, often resulting in poor airflow and limited green space. Despite smaller family sizes, overcrowding is still prevalent because low-income groups share housing units due to affordability issues. This, ultimately, leads to overcrowding and discomfort. Notably, current trends emphasize sustainability and community development, which may be lacking in older designs.

A smaller living space, an aging building, inadequate facilities, and increased environmental stressors can negatively impact personal well-being and contribute to poor mental health. Due to financial constraints, lower-income groups are often unable to afford better living conditions, leading them to reside in high-density, low-cost public housing in urban areas. Moreover, as the number of dependents grows and living spaces remain limited, the home fails to provide a restful environment for residents after work. Over time, these factors can lead to poor mental health and mental health issues (Ghazali, Marzukhi, & Leh, 2021).

Additionally, Lichtenthaler (2022) also highlighted that a home that meets engineering or architectural standards may not necessarily be considered adequate or satisfactory by its occupants. Therefore, the house is a key factor in a series of elements that influence individuals' overall satisfaction.

According to Cohen, Manion and Morrison (2020), the satisfaction of users with low-cost public housing is a crucial factor in determining their quality of life. Specifically, aspects such as housing infrastructure, facilities, design, and the surrounding environment are key contributors to overall quality of life.

In order to assess the level of residents' satisfaction, it is required to evaluate specifically of the unit location and within the particular environment

that is managed under a certain type of institutional management and administration (Oladapo, 2006).

According to Lynch (1960), an image forms the basis for an individual's attitude and emotions toward the components of a system, and the overall emotions provide the foundation for one's relative satisfaction with each subsystem. In Malaysia, however, this information regarding low-cost public housing has largely been overlooked (Md Sani, 2007).

Enhancements in residential development are essential to improving satisfaction with low-cost housing, thereby advancing the goal of smart cities (Dzulkalnine et al., 2022).

The basic principles concerning low-cost public housing involve internal comfort, safety and access to public facilities. Acoustic comfort is a key component of Indoor Environmental Quality (IEQ), referring to protection from unwanted noise. In medium-rise low-cost public housing, high density, poor sound insulation, and inadequate spatial planning often result in noise disturbance, affecting residents' well-being, sleep quality, and overall satisfaction (Ghazali et al., 2021).

In Malaysia, acoustic performance is not strongly addressed in regulations such as the Uniform Building By-Laws (UBBL) Malaysia, which focus mainly on safety and basic habitability. However, acoustic comfort can be strengthened by incorporating specific by-law provisions, such as minimum sound insulation standards between dwelling units, control of impact noise transmission in floors, and zoning requirements to separate noise-sensitive spaces from circulation areas. Poor acoustic conditions in high-density housing may contribute to dissatisfaction and variability in residents' perceptions of housing quality. This is consistent with findings that Indoor Environmental Quality, including acoustic performance, plays a significant role in residential satisfaction and overall quality of life (Abdollahzadeh et al., 2023).

In Malaysia, prices that have been emphasized include the suitability of the design in the local climate, space efficiency, and affordability in cost (Hanapi et al., 2023). This principle also includes compliance with construction regulations to establish the safety as well as comfortability of the residents (Musa, Rahman, Azman, Lip, & Hashim, 2021). Furthermore, the 'house as a living space' concept emphasizes the significance of psychology and social aspects in housing design (Ibrahim, 2019).

METHODOLOGY

This study adopted a quantitative research design to examine the influence of low-cost public housing design factors on residents' satisfaction. A quantitative approach was selected as it enables objective measurement of residents' perceptions and statistical assessment of relationships between housing design attributes and satisfaction outcomes. The study employed a cross-sectional survey

design to capture residents' evaluations of their housing environment at a single point in time.

The research was conducted in selected medium-rise low-cost public housing developments in Selangor, Malaysia. Selangor was chosen due to its high level of urbanisation and concentration of government-developed low-cost public housing schemes. The target population comprised adult residents living in low-cost public housing, particularly developments managed by Perbadanan Kemajuan Negeri Selangor (PKNS). Only residents who had resided in the housing schemes for a sufficient duration to evaluate their living conditions were included.

A combination of snowball sampling and mall-intercept sampling techniques was employed to obtain responses from residents across different housing schemes within the Klang Valley. These non-probability sampling methods were adopted to address access constraints commonly associated with low-cost public housing communities. The final sample size was adequate for multivariate statistical analysis and structural modelling.

DATA COLLECTION

Data was collected using a structured questionnaire developed from an extensive review of housing design and satisfaction literature. The questionnaire consisted of ten sections: respondent demographics, social sustainability, quality of life, product quality, design, facilities, environment, community development, impact and recommendations. All items were measured using a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The questionnaire items were adapted from validated instruments to ensure content validity and contextual relevance.

To ensure the breadth of data collection and the accessibility of the questionnaire, this study distributed the survey offline. For offline respondents, the research team provided a live link to the online Google form and offered on-site query responses in the questionnaire, a hybrid approach intended to maximize the coverage of the survey and ensure participation from a diverse group of individuals. Additionally, the research team directly informed the public about the purpose and importance of the study through live interactions at community events, not only increasing the willingness of respondents to participate but also helping to enhance the accuracy and reliability of the data.

DATA ANALYSIS METHOD

In this research, a comprehensive analysis was conducted on the data collected to uncover how design affect the satisfaction for low-cost public housing in Selangor. The analysis followed rigorous statistical procedures to ensure the reliability and universality of the research outcomes.

Descriptive statistical analysis was employed to outline the respondents' reactions to various items on the questionnaire, including calculations of frequency, mean values, and standard deviations. This step provided us with a preliminary understanding of the overall perception of public housing design that impact the satisfaction of the residents for low-cost public housing within the community as viewed by the respondents.

Data analysis was performed using SPSS and SmartPLS software. Descriptive statistics were used to summarise respondents' profiles and overall perceptions. Inferential and structural modelling techniques were subsequently applied to examine the relationships between housing design factors and residents' satisfaction. Prior to hypothesis testing, the measurement model was assessed to confirm acceptable reliability and validity. Statistical significance was evaluated at a 95% confidence level ($p < 0.05$).

To gain an in-depth understanding of the open-ended responses provided by the respondents in the questionnaire, content analysis was also adopted in this study. This method involved categorizing and summarizing respondents' comments, summaries, and suggestions. This qualitative analytical component provided us with additional insights, aiding in the understanding of the deeper motivations and viewpoints underlying the quantitative data.

RESULTS

The satisfaction measures indicate moderately favourable perceptions among residents, with mean scores of 3.74 for S1 and 3.67 for S2. However, the exceptionally high standard deviation observed for S2 ($SD = 2.43$) suggests substantial variability in residents' responses. This wide dispersion indicates that while some residents report high levels of satisfaction, others experience considerable dissatisfaction. Such divergence points to uneven housing conditions and inconsistent design quality across units or housing schemes, likely influenced by factors such as differences in building maintenance, workmanship, spatial configuration, or access to facilities. These findings highlight that average satisfaction scores may mask underlying disparities in residents' lived experiences, underscoring the need for more nuanced, disaggregated analyses to identify the specific design and management factors contributing to satisfaction gaps within low-cost public housing developments.

Table 1: Respondents' Ratings of Satisfaction Dimensions.

Perception Dimension	Items	Mean	Standard Deviation	Interpretation
Are you satisfied with the design of your unit	S1	3.744	1.035	Agree
Does the design of your unit affect your quality of life?	S2	3.677	2.426	Agree (High Variability)

Source: Author

Product Quality recorded moderate mean scores across all items, ranging from 3.09 to 3.45. Among these, PQ1 received a relatively higher evaluation, while PQ4 registered the lowest mean score, indicating comparatively weaker perceptions of that attribute. The narrow dispersion of mean values suggests limited differentiation in residents' assessments of product quality, reflecting neither strong satisfaction nor pronounced dissatisfaction. Instead, this pattern points to a general sense of ambivalence toward product attributes, likely indicating that while basic functional requirements are met, product quality does not exceed residents' expectations or contribute meaningfully to enhanced satisfaction. These findings imply that improvements in material quality, workmanship, and durability may be necessary to elevate residents' overall perceptions of housing quality.

Table 2: Respondents' Ratings of Product Quality Dimensions.

Perception Dimension	Items	Mean	Standard Deviation	Interpretation
The residential area provide safety against accidents due to falling, tripping, theft, burglary, crime rates in the area, etc.	PQ1	3.445	1.239	Agree
The residential area have adequate lighting, fire extinguishers, water sprinklers, fire alarms, ventilation, etc.	PQ2	3.142	1.286	Strongly Agree
The residential area have adequate garbage bins, incinerators for disposal.	PQ3	3.286	1.297	Agree
The residential area provides provision for	PQ4	3.095	1.27	Agree

maintenance in roofs, walls, ceilings				
The residential area main sources of power and water supply are sufficient	PQ5	3.137	1.259	

Source: Author

In contrast, Design was evaluated more favourably, with mean scores ranging from 3.01 to 3.76. Items DE5 and DE4 recorded the highest ratings, indicating that specific functional and aesthetic design attributes were perceived more positively by residents. This pattern suggests that design-related features exert a stronger influence on residents' evaluations compared to other housing attributes, particularly where they directly affect daily usability, comfort, and visual appeal.

Table 3: Respondents' Ratings of Design Dimensions.

Perception Dimension	Items	Mean	Standard Deviation	Interpretation
The unit have practical space layout	DE1	3.192	1.258	Agree
The unit is adequate in size	DE2	3.012	1.253	Strongly Agree
The unit have comfortable design with good functionality and noise reduction	DE3	3.341	1.252	Agree
The unit have adequate natural ventilation	DE4	3.684	0.958	Agree
The unit is using sustainable materials	DE5	3.756	0.928	

Source: Author

Facilities received a moderately positive evaluation overall, with FC1 recording a relatively high mean score (3.81), indicating satisfaction with certain facility-related aspects. However, FC4 registered a notably lower mean score (2.90), reflecting dissatisfaction in specific facility provisions. This contrast suggests uneven facility performance across housing developments, where selected facilities meet residents' needs while others remain inadequate, potentially limiting the overall contribution of facilities to resident satisfaction.

Table 4: Respondents' Ratings of Facilities Dimensions.

Perception Dimension	Items	Mean	Standard Deviation	Interpretation
The residential area provides sufficient open spaces	FC1	3.811	0.858	Strongly Agree
The residential area provides sufficient parking spaces	FC2	3.602	1.003	Agree
The residential area provides availability of sports and recreational facilities.	FC3	3.744	0.899	Agree
The residential area provides infrastructure for disabled residents	FC4	2.896	1.249	Agree
The residential area provides telecommunication and Internet services	FC5	3.391	1.327	Agree

The structural model results indicate that community development ($\beta = 0.326$, $t = 5.431$, $p < 0.001$) and design ($\beta = 0.326$, $t = 4.125$, $p < 0.001$) are the strongest predictors of residents' satisfaction. Facilities ($\beta = 0.170$, $t = 2.493$, $p = 0.013$) and product quality ($\beta = 0.133$, $t = 3.361$, $p = 0.018$) also exert significant positive effects, albeit with lower magnitudes. In contrast, environment ($\beta = -0.021$, $t = 0.321$, $p = 0.748$) and social sustainability ($\beta = -0.032$, $t = 1.398$, $p = 0.162$) do not demonstrate significant relationships with satisfaction. Overall, the results suggest that residents' satisfaction is primarily driven by immediate, tangible design attributes and community-related factors.

Table 5: Structural Model Results (Standardised Path Coefficients).

Hypothesized Relationship	Hypothesis	β	t-value	p-value	Result
Community Development → Satisfaction	H2	0.326	5.431	0.000	Supported
Design → Satisfaction	H4	0.326	4.125	0.000	Supported
Environment → Satisfaction	H6	-0.021	0.321	0.748	Rejected
Facilities → Satisfaction	H8	0.170	2.493	0.013	Supported

Hypothesized Relationship	Hypothesis	β	t-value	p-value	Result
Product Quality → Satisfaction	H10	0.133	3.361	0.018	Supported
Social Sustainability → Satisfaction	H12	-0.032	1.398	0.162	Rejected

The structural model results are presented using standardised path coefficients (β), allowing comparison of the relative strength of each predictor. Significance was assessed using bootstrapping, where t-values > 1.96 and p-values < 0.05 indicate statistically significant relationships.

DISCUSSION

Significance and Interpretation of Research Findings

The findings of this study demonstrate that resident satisfaction in medium-rise low-cost public housing is shaped primarily by tangible, design-related attributes rather than by housing provision alone. Across all constructs, mean scores generally fall within the moderate range, indicating that while basic housing needs are met, current design and construction practices do not generate consistently high levels of satisfaction. The data alligns with Othman et al., 2022, where the design considers the need for personal space and common areas, such as the kitchen and living room, is vital in enhancing occupants' satisfaction and QoL.

Satisfaction indicators (S1 and S2) recorded moderately favourable mean values, suggesting general agreement that unit design influences residents' experiences. However, the exceptionally high variability observed for S2 highlights divergent perceptions among residents. This dispersion implies that satisfaction is unevenly distributed, likely reflecting inconsistencies in design quality, maintenance conditions, and facility provision across housing schemes. Importantly, this finding suggests that average satisfaction scores may conceal significant disparities in lived experiences, reinforcing the need for disaggregated design and performance evaluations in low-cost housing developments. This is supported by CIDB (2020), that a good housing design should meet the functionality regarding various household types.

Product Quality emerged as one of the weaker-performing dimensions, with all items registering moderate mean scores and minimal differentiation. This pattern reflects a state of ambivalence rather than strong approval, indicating that materials, workmanship, and durability meet minimum expectations but fail to deliver lasting satisfaction. The consistently moderate evaluations suggest that product quality does not function as a satisfaction enhancer, but rather as a baseline condition adequate when present, yet highly dissatisfying when compromised. A research by Norazmawati, Asmalia and Mohd Fadzi (2020) in low-cost public housing in Kuala Lumpur mentioned that poor quality that leads

to inadequate space and ventilation caused residents problems such as stress and depression. This study also noted that residents who live in units with better natural light reported higher satisfaction in their lives since they enjoy a more comfortable environment and less dependency on human-made lighting.

In contrast, Design received comparatively higher evaluations, with several items approaching the upper range of agreement. Well-rated design attributes appear to exert a stronger influence on residents' perceptions, particularly where spatial layout, functionality, and usability directly affect daily living conditions. These results reinforce the role of design as a critical satisfaction driver in low-cost housing, underscoring that thoughtful spatial planning and functional design can partially offset constraints associated with affordability. Housing design may affect the mental and emotional well-being of the residents. Studies suggest that green spaces, water and natural landscapes around housing areas could help release tension and fix intellectual fatigue (Schneider-Skalska, 2019).

Facilities exhibited mixed performance, with some aspects receiving high satisfaction scores while others fell below acceptable levels. This inconsistency suggests that facilities contribute to satisfaction only when they are reliable, accessible, and responsive to residents' needs. Poorly performing facilities, however, undermine overall satisfaction and amplify perceptions of inequality within housing developments. In low-cost public housing in Selangor, a study by Fadzil and Ismail (2021) noted that inadequate facilities like playgrounds, community centers and green spaces negatively affect the residents' social interaction. The study highlighted that those who reside near facilities such as grocery shops, schools and clinics demonstrate better satisfaction in life.

Collectively, these findings highlight that resident satisfaction in low-cost public housing is not determined by housing provision alone, but by the quality, consistency, and usability of design-related attributes. The results underscore the importance of shifting low-cost housing strategies from a quantity-driven approach toward a design- and satisfaction-oriented framework that prioritises physical quality, functional performance, and equitable living conditions. Such a shift is essential for enhancing resident satisfaction and ensuring the long-term sustainability of low-cost public housing developments. Abed & Alzghoul, 2023, agrees that factors such as access to public amenities, suitability of house units with family size, and safety significantly impact the residents' social satisfaction.

Contributions To Empirical Research

This study makes several important empirical contributions to the literature on low-cost public housing and resident satisfaction, particularly within the context of developing urban environments. First, it provides quantitative evidence identifying specific housing design attributes as significant predictors of resident

satisfaction in medium-rise low-cost public housing. By empirically isolating the effects of design, product quality, and facilities, the study advances understanding beyond general assessments of housing provision and highlights the central role of physical design quality in shaping residents' lived experiences.

Second, the findings contribute empirically by revealing substantial variability in resident satisfaction, as reflected by high dispersion in selected satisfaction indicators. This variability demonstrates that average satisfaction scores may obscure unequal housing experiences and underscores the importance of examining intra-group differences when evaluating housing performance. The study thus adds empirical depth by capturing not only central tendencies but also disparities within low-cost housing developments.

Third, this research extends empirical housing studies by demonstrating that product quality functions as a threshold condition rather than a satisfaction enhancer. Moderate and weakly differentiated evaluations suggest that while acceptable material quality is necessary to avoid dissatisfaction, it alone is insufficient to generate positive satisfaction outcomes. This insight refines existing empirical assumptions that improvements in construction quality automatically translate into higher resident satisfaction.

Finally, the study contributes methodologically by employing a quantitative method empirical design, integrating large-scale survey data. This approach strengthens empirical reliability and offers a robust framework for future housing research seeking to link design attributes with resident-centred outcomes. Collectively, these contributions enrich empirical evidence supporting a shift toward design-led, satisfaction-oriented evaluation frameworks for low-cost public housing.

CONCLUSIONS

This study examined the influence of housing design factors on resident satisfaction in medium-rise low-cost public housing in Malaysia. The findings indicate that resident satisfaction is shaped primarily by tangible design-related attributes, particularly spatial layout, functionality, product quality, and facility provision, rather than by housing availability alone. While overall satisfaction levels were moderately favourable, substantial variability in residents' responses highlights uneven housing conditions and inconsistent design performance across developments.

Design emerged as the strongest contributor to resident satisfaction, suggesting that well-considered spatial planning and functional design can significantly enhance residents' daily living experiences, even within affordability constraints. In contrast, product quality was perceived as adequate but insufficient to generate strong satisfaction, functioning instead as a baseline requirement. Facilities exhibited mixed performance, reinforcing that satisfaction

depends not on their presence alone but on their quality, accessibility, and reliability.

Overall, the study underscores the need to shift low-cost public housing strategies from quantity-driven delivery toward a design and satisfaction-oriented approach. Prioritising design quality and consistent implementation is essential to improving resident satisfaction and ensuring the long-term sustainability of low-cost public housing developments.

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