

Sustainable Housing: A Preferred Approach to the Request of Housing Facility in Nigeria

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Abstract

Exhaustive studies have investigated housing situation in Nigeria in terms of demands, supplies, deficits, standard, finance, delivery and affordability. However, little or no studies have been done on how the housing that has and needs to be provided will give a long time satisfaction to the changing needs of users across their lifetime. The investigation of longtime satisfaction in building instigated by changing needs that result from ageing progression is necessary as studies have reported an inevitable biological and mental change in the users. This study investigated for such design type that would be compliant to the changing needs as the users grew in it, explored the knowledge of the design professionals and users on such design type and examined areas that improvements could be affected. 400 cases of houses designed and built by professionals and the ones with full participation of the end users in four geopolitical zones in Nigeria were examined using open-ended and close-ended interview questions on the occupants. The houses selected were owner-occupied and the occupants had lived for at least 10 years in it. The result shows that neither do the professional nor the participated users consider ageing progression during design and construction stage, thereby, resulting in the increasing desire to modify the interior spaces as the occupants grow in it. Suggestions were made on how considerations could be given to ageing process during the design stage and the need for further investigation on the subject matter.

Keywords

Ageing Progression, Housing, Nigeria, Residential Building

1. Introduction

Housing is a rigid casing that encloses and protects pieces of living and move-

able or immovable elements. It is a crucial life component system designed to shelter and provide functions such as safety, warmth and place of rest [1]. House is one of the basic necessities that have a very close effect on human lives. The importance of housing overlaps with health and many other social, economy and environment aspects that sustain or ease the life of an individual, especially at old age [2].

A house and housing that can meet the physical, social, environmental and economic needs of people help to address housing dissatisfaction that results in a modification in the later year. These physical and other needs, being the critical considerations of sustainability studies, define the ability of a house to seem natural in function, remain diverse, produce satisfaction needed and balance in all nature of use now and in future to come. Therefore, achieving a sustainable environment involves a sustainable house and housing [3].

Several studies have defined sustainable housing as a design product that reduces overall environmental impacts during and after construction in such a way that a present need is met without compromising the ability to meet the future generation needs [4] [5]. Also, various approaches, measured in a different context and serving different purposes, have been deployed by previous researchers in investigating the sustainability of housing development. For instance, sustainability has been evaluated from the perspective of affordable housing [6], public housing program [7] and even from low carbon housing [8].

Also, [9] through analytic framework assessed sustainable housing using location, construction and design, energy efficient and housing regeneration as sustainable indicators, while decision matrixes such as safety, access to leisure, employment, transport services were used by [6]. Overall, the physical, social, economic and environment are four dimensions that have been used to assess sustainable housing development.

However, the view of this study looks into the ability of a housing design product to meet the present need of the occupant without compromising the future needs of the same occupant. Needs changes as people grow, forming the bases for housing demand and people's objectives of developing their houses. Human, the occupants of a design product, experiences biologically, socially and culturally change as they grow older and the needs in housing changes being influence by ageing factors that become more obvious as individual experience biological growth [10]. Factors such as decreasing mobility, declining physical strength, loss of vigour and increasing frailty are ageing factors that affect individuals in ways that impact their preferred choice of housing [11]. When these ageing factors become palpable, it often shows the need for some support or adaptation for the present housing products to be suitable [12] [13]. These ageing factors show that understanding the needs of the people, as well as their idea is an important indicator that can increase the life of housing, decrease cost and reduces social and environmental impacts.

With the present population size in Nigeria, scholars' reports have shown the need to build like one million houses annually, emphasising on suitable and af-

fordable housing type. Meanwhile, the beauty of the demand lies in the ability of the housing product demanded to meet the changing need of the occupants across their lifetime, therefore, necessitate the need to examine how well the existing residences have fared so far. Studies have shown the inadequacies of the available housing such as the need for modification to augment for housing deficiencies, neglect of some spaces in the house due to lack of compatibility, and relocation in some worse situation among others [14] [15] [16]. This mandates the need to address the factors responsible for the declining users' satisfaction, with the view to better improve on the emerging houses demanded that will not just meet present needs but sustainable across users' lifetime.

Given this, the study uses the effect of users' socio-economic status, the indoor living condition and building materials used for construction to assess the sustainability of existing housing development. This is done to evaluate factors responsible for the declining satisfaction of design product and to investigate the parameter for a design product that will be compliant with the growing trend in the age of occupants. A quantitative technique through the use of structured interview was used for the study. The reliability of this method lies in the fact that verbal and non-verbal responses are recorded and the expression on the respondent's face can be judged when some specific questions are asked.

2. Literature Review

This section review the housing needs in Nigeria and the involvement of the different governing body in the past few decades using various related publications and textbooks. Also, the traditional design consideration was a review, and the emerging issues in housing provision and demands which revolves around human lifestyle, building materials and sustainability were related to past studies.

2.1. Reviewing the Housing Need in Nigeria

The involvement of the government in housing the vast populated Nigerians from the colonial period to the period of civilian administration has deployed different housing schemes through national development plans. These schemes have resulted in some good effort, though yet grossly inadequate, with many failures caused by factors such as site acquisition, expensive contractual procedures and inflations in labour cost, budget cut and insufficient capacity of construction industries, building technology and material choices [17] [18].

In just two decades of 1990-2010, the Nigeria housing deficit rose from 7 million to 14 million and still increasing [18]. The hope and expectation are that an effective and sustainable housing delivery system will be established in Nigeria, which will facilitate the mobilisation of long-term funds for shelter (housing units, infrastructure and social facilities) development especially that targeted at the urban poor. Consequently, it is imperative that studies be done on how the housing facilities aimed for will be sustainable.

Previous studies have shown that habitability depends not only on the physi-

cal building characteristics, but also on the social, cultural, and behavioural aspects of the users [19] [20] [21] [22]. This means that the perception of quality in housing and its implication on satisfaction is crucial to the measure of an individual's quality of life [23]. Unfortunately, reports and studies like the [24] and [16], coupled with experiences such as the Gwari people's abandonment of an alternative resettlement housing scheme in Abuja revealed that the present housing units have poor user rating regarding perceived quality and satisfaction [16] [22] [25].

The poor perception, in most cases, is associated with the changing biological nature of humans. For instance, the implication of stairs on kneeling and hips, shortness of breath and the likes caused by loss of muscles at sixth decades of a person's life may make the house becomes unsuitable any longer. Other occurrences such as frailty that calls for reduced house size, failing eyesight that is affected by the change in levels in the building, hearing loss that makes it difficult to live in a sprawling house are just a few of all biological issues that have shaped current housing situation become inappropriate. Therefore, a housing system that is sustainable must be able to accommodate the biological change in the users; else modification will be inevitable. Where the cost of modification is not affordable, a situation of partial neglect or eventual abandonment might result.

2.2. The Design Considerations for a Sustainable Housing

The housing built for a lifetime living may be desirable at an early stage of life but become inappropriate at the threshold of old age. The concept of sustainable housing entails giving a supportive measure to the inevitable biologically changes experienced relative to ageing progression. This biological change reduces the level of independence as people grow, and increase the need for support in carrying out daily activities of living in their environment. When the characteristics of the residential housing are not supportive, the building is perceived as being no longer appropriate, and alternative means of promoting the development of active ageing is sort.

Apart from some special issues such as morbidity or disability, old age is generally accompanied by degenerative weaknesses in muscle, sight, hearing, and feeling, among others [26]. These weaknesses result in diminished mobility, the difficulty of climbing, while housework becomes difficult and cleaning of a large house becomes burdensome. Also, weaknesses like failing eyesight interfere with modest home repair and make a dark, cluttered house perceived dangerous, while the loss of sense of feeling exposes old people to extreme thermal conditions and subjects them to incessant frequenting of the health clinic. When the current housing situation reveals these inevitable experiences of the user, it shows that the housing unit is no longer appropriate to successful ageing, thereby, indicate the need to review the initial design consideration of the building.

To achieve a sustainable design, considerations that project to support the inevitable biological change in user is expected. The decline in physical strength

makes walking becomes difficult. Therefore, houses with stepped floors, stairs, poor space planning and arrangement of interior become unsuitable. Most old people have difficulty in adjusting from light to dark due to a decline in peripheral vision. An older person's eyes are particularly weak in dim light and have less ability to see close objects.

Also, two areas of the home that were most cited as causing difficulty were the stairs and bathroom/toilet in the literature. Given this, there may be a need to consider varying the colour of floor finishes to differentiate a stepped floor area or reduce the step riser to an average walking height. Another way is to adopt an open plan method of designing. Consideration of decline physical strength in users of design product will reduce falling occurrence and complications of space planning at old age.

3. Methodology

This study cut across four out of six geopolitical zones in Nigeria and the states selected in each of the zones are where we have a higher population size of older adults. The specific areas picked are Akure in Ondo state (South-West), Asaba in Delta state (South-South), Onitsha in Anambra state (South-East) and Gwagwalada and Abuja municipal in the Federal Capital Territory (North Central) (Figure 1). The essence is to cover as many ethnic groups to ascertain a generalised study result.

Buildings were randomly picked within the streets in the selected area, and where the selected building has no occupant in the considered age category, the next building to it is chosen for the study. The participants studied are of age bracket 60 years and above, occupying their owned houses and have experience of their building and possible adjustment made so far during their stay. An interview was conducted following an already prepared structured questionnaire comprising of four sections that cover respondents' education and financial status, the building material and method of construction, their experience of the selected interior spaces and possible area of improvement required.

The first two sections are close-ended where options are given to the respondents to pick from, while the other two sections that explore respondents' experiences of their interior spaces under study and area of required improvement in their buildings are open-ended. A total of four hundred participants interviewed between February and June of the year 2018 were used for this study. Other instruments like observation note and voice-activated tape recorder were also used to capture the participants' responses and expressions; each interview lasted an average of 15 minutes. The study also adopted the review of relevant literature which allowed for in-depth knowledge of factors underpinning the respondents' views to give credible and valid results.

The data collected were later transpose using the descriptive statistical method to various categories. Content analysis was further used to correlate respondents' financial status, housing situation, and challenges in performing daily routines

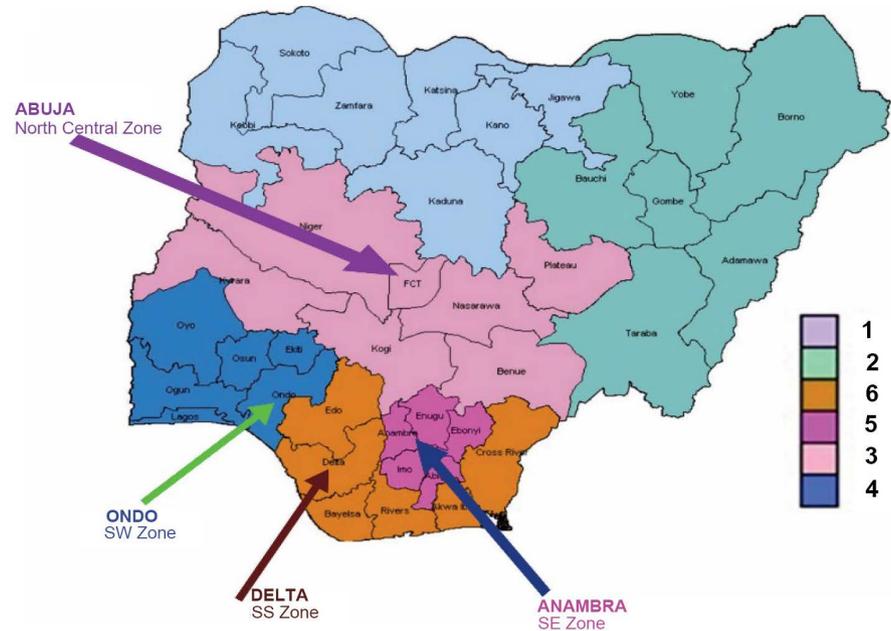


Figure 1. Map showing the study areas in the four geopolitical zones selected.

in their homes in order to determine the infusing elements needed to improve the housing facility sustainably.

4. Result and Discussion

This section shows the demographic status of the respondents, education and financial condition, the component of the buildings occupied, the experience of selected indoor space and perception of areas that improvements are needed. Four interior spaces were studied, which are the living room, bedroom, kitchen and toilet. The interview took record of the material of construction, fitting and finishes used in the interior spaces studied. Questions were asked about the performance of the interior spaces under study in its support of all activities of daily living performed by the respondents. The respondents' demographic status is detailed in **Table 1**. Responses were integrated, and general inferences were drawn through content analysis method, looking into the implication of materials used for construction, use of stairs in the building, window and door types, and material finishes choices among others. The consequent subsection unfolds the details.

4.1. Typical of the Respondents

Table 1 shows that 60% of the respondents are female and of average age between 60 and 70 years. The table also shows the record of a good number of both literate and uneducated old adult, the majority of whom are living in the family house, with spouse or house help. The table shows that only 10% of respondents interviewed live alone.

Also, the table further shows that majority of the respondents rely on family (33%) and pension (28%) with a mean average income between N21,000 and

Table 1. Demographic detail of the Aged interviewed in the studied areas.

<i>Variable</i>	<i>Frequency</i>	<i>Percentage</i>
Gender		
Male	160	40.0
Female	240	60.0
Age		
60 - 70	235	58.8
70 - 80	70	17.6
80 - 90	70	17.6
Above 90	25	5.9
Education		
None	105	26.3
Informal	38	09.5
Primary cert	47	11.5
Sec cert	105	26.3
Tertiary	105	26.3
State of living		
Alone	42	10.5
With spouse	126	31.6
With family	211	52.6
With house help	21	5.3
Income source		
Wages	89	22.2
Pension	111	27.8
Self-support	23	5.6
Family	133	33.3
NGO	44	11.1
Monthly income		
10,000 - 20,000	200	50.0
21,000 - 40,000	111	27.8
61,000 - 80,000	23	5.6
81,000 - 100,000	43	11.1
Above 100,000	23	5.6
Income regularity		
Always	200	50.0
Sometimes	178	44.4
Rarely	22	5.6
Years spend		
1 - 5	43	11.1
6 - 10	111	27.8
11 - 15	67	16.7

Continued

16 - 20	156	38.9
Above 20	23	5.6
Stayed most time		
At home	94	23.5
Inside personal shop	212	52.9
With friends	47	11.8
Go visiting	47	11.8

N40,000 (mean score of 3.17). 50% of the respondents enjoy a regular income while about 5.6% hardly enjoy regular income. Likewise, it shows in the table that 55% of the respondents lived an average of 10 years in the houses under study and the majority run a personal shop that helps social connectivity. This study coincidentally has ably represented every category that measures educational status. The study has equal representation of those that have neither formal nor informal education, those that study to secondary level and tertiary level. It shows, therefore, that the result of this study is not influenced by education status.

The study also revealed that at old age, the majority of the aged rely on their family for financial assistance, in addition to their pension for some that have served at civil services. Also, it was discovered that the respondents' adaptable measure for financial stability is by using the monthly stipends received to run a retail shop that, although did not generate much, still earn them some financial independence at the laxity of their financial source.

The respondents posit that their financial strength only aid support for food, clothing and minor commitments like services bills, house owners' association bills, among others. Conditions like improper building orientation that deprives some useful area in the interior of adequate lighting, limited control of airflow in the interior, perception of safety in some spaces, properties of wall material used to build and many more have result the aged to additional spending on health matters, purchase of additional features to improve safety, change of clothing to fit different seasons, and on artificial lighting services.

The response from the interview collated reveals that the cost implication resulted from the inability of their housing to sustain these inconsistent requirements ageing poses have subjected many of them to a concomitant peril of sick today and healthy tomorrow syndrome. Also, the general custom that places the responsibility of care and support of older people in their family has resulted in nonchalance of the government. As stated by the respondents, the pension most aged depends on are not paid frequently, the government has no support strategy for the aged, and the non-governmental agencies lack moral to do. Therefore, a sustainable house that will not pose a financial burden on the users that have grown pass working age needs to be sought to improve independent living at old age.

4.2. The Material Components of the Buildings Occupied

Table 2 shows the type of houses the aged interviewed are living in and the component materials used for the wall, doors, windows, and roofing. Almost 60% of the interviewed elders live in a bungalow apartment that has a very few or no step, 29% in a raised bungalow and only 11% in a storey building. Majority of the building wall is of sandcrete block material, only 24% was built with mud material. Sliding window with aluminium frame is the most common window type, while only 11% is a louvred window. The metal door was used mainly for the doors directly opening to the exterior of the building, while the majority of the interior doors are of wooden material. Almost 60% of the roofing covering are of old zinc material, while 35% are of long-span aluminium.

Further, **Table 3** shows the types of finishes applied to the four interior spaces under study. In most living rooms of the respondents interviewed, tiles were used for 55% of the floors, 70% of the walls are cement screed and not painted, 69% have asbestos ceiling finishes, and 75% perceives that the lighting of the living room is inadequate. In the kitchen, almost 78% of the floors are tiled, 59% of the wall have cement screed, about 67% also have asbestos ceiling finishes, and 73% complain of inadequate brightness.

Table 2. Stock of building components used in the Aged interviewed houses.

<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>
House type		
Bungalow	235	58.8
Bungalow with raised steps	118	29.4
Storey	47	11.8
Wall material		
Sandcrete plastered	259	64.7
Sandcrete not plastered	47	11.8
Laterite plastered	94	23.5
Window material		
Aluminium with glass-sliding	200	50.0
Aluminium with glass-casement	44	11.1
Wooden window	112	27.8
Aluminium louvered	44	11.1
Roofing sheet		
Aluminium	141	35.3
Zinc	235	58.8
Asbestos	24	5.9
Door material		
Steel	125	31.3
Aluminium with glass	25	6.3
Wood	250	62.5

Table 3. Details of the material finish used in the interior of the buildings.

<i>Variables</i>	<i>Lounge %</i>	<i>Kitchen %</i>	<i>Bedroom %</i>	<i>Toilet %</i>
Wall				
Screed	68.8	58.8	54.5	53.8
Paint	25.0	35.3	36.4	23.1
Wall paper	--	5.9	9.1	--
Wood	6.3	--	--	--
Tile	--	--	--	23.1
Floor				
Terrazzo	11.1	11.1	14.3	12.5
Tile	55.6	77.8	57.1	87.5
Cement screed	--	11.1	--	--
Carpet	11.1	--	14.3	--
Wood	11.1	--	--	--
Rug	11.1	--	14.3	--
Ceiling				
Asbestos	69.2	66.7	72.7	91.7
Wood	--	6.7	--	--
Pop	23.1	20.0	18.2	--
Concrete	7.7	6.7	9.1	8.3
Brightness				
Very adequate	--	--	--	7.1
Adequate	16.7	28.6	27.3	42.9
Inadequate	75.0	71.4	72.7	50.0
Very inadequate	8.3	--	--	--

Not as different is the bedroom as 73% uses asbestos ceiling finishes, 57% of the floors are tiled, 55% of the walls are cement screed, and 73% posits inadequate lighting. However, a bit of difference is reported of the toilet space, as only half of the respondents perceived their toilet lighting to be insufficient. Almost 92% of the toilet space has an asbestos ceiling, 88% of the floors are tiled, and about 54% of the walls are cement screed.

4.3. Users' Experience of Their Interior Spaces

The report gotten from the respondents reveals that the professionals did not design the majority of the houses that have very minimal or no step. Most of the ones designed by the professionals are characterised by appealing aesthetics, where materials were selected to fit into the modern trend of housing, and the interiors spaces are either stepped up or down to each other at a riser height of 200 mm maximum. Ironically, only the aged living in the house that was not designed by professionals report a positive perception of good living in the interior spaces, not bordered about safety and requires minor changes in their interior.

Those that are living in raised bungalow or storey buildings complain of the difficulty in climbing, especially those stair or steps without two-sided railings. Some living in storey building report to have relocated to the ground floor converted a space meant for another function into a bedroom space to avoid climbing. Those living in the interior that has varies of floor level report that they regret the consequence of the design product they have once loved, especially at the time of their life that the financial implication of renovation is not affordable. It is worthy of note to add that the houses without professional touch, but fits into the present need of the users at old age was not planned for. It was financial incapacity that limited their aspiration as at the time of construction. Therefore, it shows that neither the house owners nor the professionals consider the future need that ageing progression poses at the time of design and construction of the building.

Also, **Table 2** and **Table 3** show that the majority of the building walls of the respondents are plastered with very few painted in all the interior spaces studied. Asbestos was also used for the ceiling finish, while the majority of the floors are tiled. The reports from the respondents' reveal the perception of lighting inadequacy in all the interior spaces studied. This is not unexpected when we consider the wall and ceiling finish used in these old people interior Vis a Vis their building orientation in maximising natural lighting.

The asbestos sheet is grey in colour, and the cement screed also does come out in a darker grey colour hue. With this scenario, it is expected that a greater level of lighting would be absorbed and the value of intensity will be low. Therefore, a design that orientates for better penetration of natural lighting, or the used of reflective material for furniture works would have improved the lighting situation in the interior.

Likewise, widespread usage of sandcrete wall material for construction and sliding window presented itself as a bad choice at old age. The respondents explained that most time, little or no difference is felt in both the interior and exterior of their residential spaces. Most times the temperature is relatively the same in their interior just as the exterior in both hot and cold seasons. Since the sandcrete wall does absorb the temperature of the external space completely, there is a need to control other sources of airflow to the sufficient thermal condition that brings comfort to the old ones. Although the sliding window operation reduces the allowance of airflow to 50%, sometimes 50% might still be disproportionate. This needed consideration as the study has shown that loss of feeling makes the aged vulnerable to thermal discomfort. The respondents report that usage of heavy clothing has been the adaptable measure of dealing with the thermal condition of their interior spaces, mostly in the bedroom.

Furthermore, **Table 2** shows that aluminium and zinc materials are the common materials used as roof covering of the respondents' buildings. These materials are permeable to sound, and as a potential contributor to noise pollution in building disturb through the stretching and contrasting responses to climate change. Also, the asbestos ceiling finish used is also a poor soundproof material.

The respondents report that the noise pollution constituted by these prevalent materials is worse during the rainy season. Therefore, a more absorbing material such as wood, common in this part of the world, would have sufficed if used as ceiling finish against asbestos.

5. Recommendation and Conclusion

This paper has identified and emphasised consideration of the biological change of users as an essential way of improving the satisfaction level of the design product. This paper considered the old people residential interior spaces *vis-à-vis* the materials used for construction and the selected finishes used in the interior spaces studied. The study shows that the level of financial independence declines as people age, thus, housing that requires modification needs to adjust to future user needs to be placed an unbearable financial burden on the majority at old age. This study shows that the inability to make these necessary adjustments has further subjected many old individuals with financial incapacity to declined health.

Furthermore, the study shows that majority of the respondents use the modern material for construction with prevailing walling material being sandcrete block. This permeable wall material is disadvantageous in climate adaptation. Thus, there was evidence of the harsh thermal condition. Also, there was evidence of poor light reflection in the interior due to factors such as poor building orientation, the permeability of the material, and shape and size of the building. The usage of aluminium and zinc material for roofing without insulation has greatly contributed to noise pollution through contrasting adjustment to climatic condition.

5.1. Recommendation

Although the elderly respondents interviewed indicate a sense of contentment to their home and surroundings which can be considered as legitimate reflexes, some matters of concern have also been highlighted in this study and some of the main policy implications of the findings are outlined below:

- 1) Assessment of building regulation that includes risks and hazards of design methodology could be made, and the required adaptations could be suggested, e.g. fitting of handrails at both sides of steps or reduce the step riser to walking height, use of ramps and anti-skid flooring.

- 2) Assessment of building material performance regarding light reflection and thermal absorbent capacity. This will serve as a guide in the selection of material for construction and finishes to attain the required thermal condition and better illumination in the residential interior.

- 3) Assessment of curriculum of architecture education to enlighten the professionals under training about fundamental studies of behavioural and social humanities studies. Exposure to such foundational courses during architectural training in school will foster design product envisioned through the users' perspective.

4) There is also a need for more research on the improvement of indigenous materials for construction. The indigenous materials are a better fit into the Nigeria climate condition, are age-friendly and will also reduce the cost of construction.

5.2. Conclusion

The study shows that the residential houses are a critical component of measuring successful ageing and quality of life at old age, and that the performance of the interior spaces in creating an optimal living environment at old age should be the critical consideration of designers and structural support of design methodology. Therefore, research should be geared towards such a design product that can accommodate the biological change of the users, which is the key factor that reduces satisfaction at an older age. In the quest for sustainable design that can suit the aged, concepts like universal design, design for an intergenerational relationship and age-friendly housing have been promoted, although the consideration is to guide modification of housing at old age. While the existing concepts are capturing concern for a proper renovation of the existing house, there is need to further research on housing facility that is all age compliance to foster an improved design product that will not require future modification.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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