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Satisfaction with Housing Design Features of the Public Sector Employee Housing Schemes in Lagos State, Nigeria Using Principal Component Analysis

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Abstract Housing design features satisfaction in nine public-sector employee housing estates was explored by means of data generated from household assessments comprising 500 key participants in Lagos state, Nigeria. The survey was carried out between September, 2020 and March, 2021; and the information was gotten through well-thought-out questionnaire and subjected to descriptive statistics as well as principal component analysis. The results specifically showed that the top three housing unit design features that the residents were most satisfied with were location of bedrooms, location of entrance and exit doors and ceiling heights (headroom), while they were least satisfied with size of study area in your housing unit, size of kitchen and store in your housing unit and size of store in your housing unit. The seven main dimensions of housing design features satisfaction were quantity of natural lighting and ventilation of interior spaces; number, design and location of staircases; sizes and location of corridors, wardrobes and location of bedrooms, sizes of store, kitchen and dining and location of terraces; privacy, general design of housing units, number of toilets and location of housing units in the estates; size and type of housing unit, number and size of bedrooms; size of study, children's play area and terraces and natural ventilation of bedrooms and kitchen; headroom, location of entrances and exits and size of living area. Therefore, to improve housing design features satisfaction residents in public sector employee housing schemes, the key professionals (architects, town planners and estate managers) involved in conceptualizing, development and maintenance of the housing estates must engage in state-of-the-art planning, design and management approaches and also give priority attention to the key features that ensure residents' satisfaction.

Keywords Housing Design Features Satisfaction, Principal Component Analysis, Public Sector Employee Housing, Survey, Lagos State

1. Introduction

Housing problem in Nigeria has manifested in both qualitative and quantitative forms [1]. In an attempt to solve the housing problem, several initiatives to provide housing to citizenry have been undertaken by successive governments in Nigeria [2]. One of such is the Employee

Housing (Special Provision) Decree No 54 of 1979 which mandates employers to provide housing for the employees [3]. Many employers of Labor in public and private sectors have been providing different categories of housing for their employees. The components of public housing include the housing unit, neighborhood environment and the management features [4]. Housing unit is a crucial component of public housing because it influences how people live, eat, network, work as well as play. This is probably why there is lots of research interest on the term Housing unit. The housing unit can be further broken down into the housing unit design features, and housing unit construction features. This study focused on the housing unit design features. The physical/spatial aspect covers the design features of dwelling units and includes the standard of the environment inside the house, interrelationship of the spaces and the building structure condition (that is the house). It also includes size, layout as well as the dwelling unit's appropriateness for size of household and dwelling space composition, interior design of the dwelling units, the interior spaces ventilation and lighting and privacy in the dwelling units [5], [6].

Housing (dis)-satisfaction is a major part of residential environment that has gotten major research consideration. Housing satisfaction relates to how occupants assess their housing environment. Hence, in this research, Housing satisfaction is explained as the degree to which inhabitants are pleased or displeased with their dwelling units. In this study, Housing satisfaction is the satisfaction with the dwelling/housing unit design features alone. Other components of the housing /residential environment were not considered. Current research on housing satisfaction seeks to enhance our understanding of who is satisfied or displeased with the environment. Several researchers have considered the housing unit design features as part of housing/residential satisfaction. For instance, Abeokuta, Ogun State, Nigeria, Ibem and Amole [7] investigated the residential Satisfaction in Core Government Housing. In Lagos State, Nigeria, Jegede et al. [8] considered the assessment of residential satisfaction for sustainability in Public-Private Partnerships (PPPs) Housing Estates. Fakere et al. [9] considered the connection between the involvement of occupants in house design and residential satisfaction in Akure, Nigeria. Maina [10] considered the satisfaction with dwelling unit attributes and infrastructure within selected public housing estates in northern Nigeria. In spite of the understandings gotten from the prevalent studies, there is still a dearth of empirical studies on housing unit design features satisfaction in public sector employee housing in Nigeria.

This research was founded on two key research questions. They are: (i) To what level are the residents of housing estates provided through this scheme satisfied with their Housing design features? (ii) What are the dimensions of Housing design features in the carefully chosen housing schemes in the area of study? The research generates input to knowledge by revealing detailed parts that must be given more consideration in neighborhood physical environment in making sure that Public sector employee housing production adds to resident's satisfaction in Nigeria.

2. Literature Review

Housing Design Satisfaction: Theoretical Clarification

As earlier stated, Housing satisfaction is explained as the degree to which individuals are pleased or displeased with the dwelling unit. This is because Housing satisfaction is influenced by factors like a person's past knowledge, present truths as well as hopes. This implies that satisfaction is a subjective construct and the theories related to this study are derived from different academic disciplines like sociology, environmental psychology as well as consumer behavior.

Consequently, the theories underpinning this study are Housing Needs Theory, Housing Deficit Theory, Psychological Construct Theory as well as Social Programme Evaluation Models. Rossi [11] while conceptualizing the idea of residential satisfaction or dissatisfaction presented the idea of housing needs. In the housing need theory, Rossi [11] pointed out that varying housing requirements as well as desire as household move through a diverse life cycle phase, often place families out of conformity with the conditions of their houses and the neighborhood at large. The fact that their current needs and their desired needs do not align most of the time makes the residents dissatisfied with their current residence. Therefore, the way the residents react to this stress or lack of satisfaction causes them to move from one housing to the other. Thus, a family housing should be adjustable or adapted to their needs, as changes in resident's life cycle could produce different requirements in space, which have been identified as the most important part of residents housing needs. Consequently, there may be dissatisfaction expressed by households because their houses and neighborhood have not been able to achieve their housing needs as well as desires [12]. In conceptualization of satisfaction or dissatisfaction in residential housing, introduction of the concept called housing deficit was made by Morris and Winter [13]. The authors established the fact that individuals should make judgement about the conditions of their housing based on parameters that were normatively defined. These parameters include norms, which are cultural, influenced by the standards/rules of the society as regards their condition of living, and norms that are either family related or personal. These family related/personal norms are standards defined by the households as regards their housing needs. This may lead to housing adjustment or residential mobility. As, housing deficit is a result of the variance between an individual/household's actual situation as regards housing and the cultural and /or family housing norms, which however causes lack of satisfaction in residential housing.

An introduction was made by Galster and Hesser [14] into the idea of residential satisfaction's psychological construct and came up with a theory that it is possible that persons are constructing cognitively a condition as a reference for each chapter of their residential condition. The person's self-assessed needs as well as aspirations will be dependent on the quality or quantity of the reference condition [15] [16]. However, if the perception of the individual's current condition is close in resemblance with or even greater than the reference condition, the individual will be observed to manifest a state of psychological satisfaction [15] [16].

Taking into consideration that employee housing schemes are social programmes, social programme evaluation models are considered relevant to this study. Although a number of programme evaluation models exist, the one considered relevant in this study is the utilization-focused evaluation model. In this evaluation model, the evaluator must first identify those intending to use the result of the evaluation before the evaluation study is designed. This implies that the evaluator plans for the anticipated consumers of the evaluation before collection of data [17]. In other words, every evaluation study is guided by the consideration given to the intended users of information. The key strength of this model is the fact the perspective of the prospective users of evaluation result was known and put into consideration even before designing and collecting data for the evaluation. Based on the literature reviewed for this research, it was revealed that the majority of the research on public housing satisfaction was utilization-focused evaluation.

From these review theories, evaluation of satisfaction with housing design features can be assumed to mean the level to which a person's dwelling unit design features align with both the family norms, cultural norms, housing needs based on lifecycle changes and psychological construct or reference conditions. This is because the perfect benchmark is most often centered on socio-economic position, present requirements, prospects, and targets of the inhabitants as well as some preset benchmarks in addition to criteria recognized by governments with experts.

Satisfaction with Housing Unit Design Features

According to Ibem and Aduwo [4], Housing component contains the housing unit features, housing unit support services, neighborhood features and management features. The housing unit features can be further broken down into the housing unit design features and housing unit construction features. This study is focused on the housing unit design features. Therefore, the term Housing design features often refers to building structure size, their functions and the quality of the indoor space [18]. In a study on Housing in Malaysia, the study posited that housing size was often connected to the satisfaction obtained by occupants on the particular housing [19]. This correlation between Housing size and level of satisfaction was also supported by another study by Ibem and Aduwo [4] suggesting that sizes of spaces for living and sleeping are very important when analyzing user's satisfaction. Aside from the sizes of spaces provided in buildings, the way these spaces are finished internally also contributes to the satisfaction of occupants with their residence [20]. Another key factor that affects the satisfaction of occupants with their residence is functionality, and this is because functionality includes the provisions of adequate spaces for cooking, washing, dining areas and living spaces [21].

Several studies have investigated satisfaction with housing unit design features as part of housing satisfaction. For instance, Alnsour and Hyasat [22] examined the level of satisfaction with residence among low income housing residents. The study pointed out that though there was a moderate satisfaction with the overall housing environments, these observations on satisfaction with housing features and housing services were not constant, instead when analyzed with various variables. With respect to building features, quality of service provided among others there was varied response. While investigating the satisfaction of residence in public housing in Abuja, Nigeria, a study by Ukoha and Beamish [23] discovered that the occupants in these housing ownership types showed dissatisfaction with the entire housing environment, they were not satisfied with the type of buildings, their features, the current building conditions, and the management of these housing types among others, even though they were satisfied with all the facilities provided in the neighborhood. Mohit and Azim [24] assessed satisfaction with buildings in public housing in the Maldives, and these assessment included the housing features, services provided within the individual residential units, auxiliary facilities and the social situation that is prevalent within the area and the contribution of these factors to the occupants overall satisfaction with their buildings. Findings from this study revealed that a large number of occupants were moderately satisfied, however when analyzing these levels of satisfaction differed and was higher generally when analyzed for services and facilities provided for these residence and lower when compared to their level of satisfaction with the spaces provided for within each housing units and the social characteristics that is prevalent within the building area. The connection between occupants' satisfaction with their residence to the entire estate or districts, their internal and external living conditions and the effect on the psychological well-being on occupants was considered by Phillips et al. [25], the findings showed that occupants satisfaction with their building environment was gotten by analyzing the entire internal and external conditions of their residence, even though they were analyzed separately. However, additional analysis showed that there was no direct link between the building conditions and the psychological wellbeing of the occupants. A separate study by Ibem et al. [2] that relied on administering

questionnaires to respondents to investigate occupants satisfaction with their residence among low income housing occupants in selected public subsidized housing in urban areas; discovered that a greater number of the respondents were not satisfied with the physical environment around these public housing estates, however these residences were satisfied with all the internal spaces provided and the privacy available in their various housing units; as per the economic activities in these housing estates, they were least happy.

From the foregoing, it is obvious that there is a very slim probability of arriving at a common supposition on the end results of research on housing design satisfaction in the diverse nations. This is for the reason that among the numerous parameters picked, explicit variables were seen to have a vital impact on housing design features satisfaction in many studies, but were inconsequential in others. This may be because of the variances in analyses done and variables used in each study. In addition to that, it can also be because some of these studies evaluated housing/ residential environment as a whole which comprises the combination of the housing unit design features as well as the housing unit construction features, housing unit support services, neighbor features and management features.

3. Methodology

The information used in this survey was gotten from a part of the questionnaire of a larger investigation to assess the outcomes of public sector employee housing scheme in Lagos State, Nigeria. Cross-sectional survey was the research design and it was done between September, 2020 and March, 2021. The Housing estates picked for the inquiry were those under the Lagos State staff housing board. The research population is made up of residents in 1148 dwelling units in 48 housing estates/locations under the Lagos Staff Housing Board with household heads as respondents. Two step sampling method was used to get size of the sample. The public sector employee housing units were grouped into local governments' area of Lagos state (Agege, Ifako-Ijaiye, Oshodi–Isolo, Amowo-Odofin, Ikeja, Ikorodu, Mainland, Island, Surulere, Kosofe Local Government, Badagry). Purposive sampling procedure was used to select six (6) local government areas out of the listed eleven (11) local government areas that have the public sector employee housing units. These location government areas were selected due to the high concentration of civil servants in this location and the high population of Lagos citizens within the local government area [26]. The local government selected includes Agege, Ifako-Ijaiye, Oshodi–Isolo, Amowo-Odofin, Ikeja, Ikorodu local government areas. Also a purposive sampling procedure was used in picking the housing unit within these local governments due to the limitation of access to some of these housing estates (see Table 1). Therefore, the total sample size calculated for the study was 688 units. 500(72%) copies of the questionnaire were retrieved and used in the analysis.

Explicitly, housing design features were identified through the literature search on the subject area, and the results gotten were used in framing the questions used in the survey forms. The literature search showed 37 variables for evaluating the satisfaction with housing design' features. In the investigation, the participants were asked to specify the level of satisfaction of the variables based on the 5-point Likert scale with 1= Very dissatisfied, 2= Dissatisfied, 3= Not Sure, 4= Satisfied, and 5= Very Satisfied. The research was associated with the distribution of well-thought-out and pre-tested questionnaire to the family heads or representatives of each dwelling unit in the estates surveyed. All 688 copies of questionnaire were disseminated (see Table 1). A total of 500 copies were reverted as well as analyzed. This signified around 73% rate of response.

Table 1. Estates investigated

	Local Government	**Housing Estates /Location**	**Total Number of Units**	**retrieved**
1	Ifako-Ijaiye	Ogba Phase 2	280	258
2	Ikeja	Hos Staff Quarters	94	32
3	Ifako-Ijaiye	Ijaiye Medium Housing	26	23
4	Ifako-Ijaiye	Lsdpc Estate Ojokoro	18	16
5	Oshodi – Isolo	General Hospital, Isolo quarters	14	5
6	Amuwo Odofin	Amuwo Odofin Low Cost	94	68
7	Ikorodu	Tos Benson Estate, Owutu, Ikorodu	98	59
8	Ifako-Ijaiye	Millenium Estate	40	20
9	Agege	Ijaiye Low Cost Pen Cinema	24	19
		Total	688	500

With regards to the analysis of data, the 37 variables were first assessed through descriptive statistics to show the mean satisfaction scores, representing the average satisfaction score given by all the respondents. Similar studies [27-31] used this method. The 31 variables were further exposed to factor analysis. A prior suitability of the survey data for this analysis was ascertained by conducting the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and the Bartlett's Test of Sphericity. The KMO test produced 0.94, which is above the acceptable value of 0.6, while the Bartlett's Test of Sphericity was significant at 0.000. Therefore, factor analysis is appropriate. Factor extraction using Varimax Rotation method with Kaiser Normalization was used to pinpoint the dimensions of

satisfaction with housing design features assessment in the research. The use of principal component analysis was to amass and associate the numerous variables with one another under the various scopes.

4. Results

Satisfaction with Housing Unit Design Features

Table 2 shows the descriptive statistics of the respondents' satisfaction with their housing units' design features in the estates sampled. Based on the mean satisfaction scores for each of the 37 attributes investigated on the 5-point Likert scale with 1= Very dissatisfied, 2= Dissatisfied, 3= Not Sure, 4= Satisfied, and 5= Very Satisfied, the respondents in the survey were satisfied with the attribute ranked 1st to 32nd positions and dissatisfied with those ranked from 33rd to 35th positions in Table 2. The results specifically show that the top three housing unit design features the residents were most satisfied with were location of bedrooms, entrance and exit doors and ceiling heights (headroom), while they were least satisfied with the sizes of kitchens and storages in their dwelling units (Table 2). In all, these mean that they were satisfied with 34(91.90%) and dissatisfied with only 3(8.1%) of the 37 housing units' design features investigated in this research.

Table 2. Descriptive Statistics of Residents' Satisfaction with Housing Units Design Features

Housing Units' design features	1	2	3	4	5	No response	N	Mean	Rank
Location of bedrooms in your housing unit	14(2.8)	42(8.4)	100(20)	277(55.4)	50(10.0)	17(3.4)	483	3.64	1st
Location of entrance and exit doors	17(3.4)	55(11)	73(14.6)	282(56.4)	56(11.2)	17(3.4)	483	3.63	2nd
Ceiling height (headroom)	18(3.6)	57(11.4)	90(18)	247(49.4)	69(13.8)	19(3.8)	481	3.61	3rd
Location of your housing unit within the estate	18(3.6)	52(10.4)	95(19.0)	257(51.4)	61(12.2)	17(3.4)	483	3.60	4 th
Quantity of natural lighting in the bedrooms	19(3.8)	47(9.4)	112(22.4)	253(50.6)	48(9.6)	21(4.2)	479	3.55	5 th
Location of the staircase(s) (if any)	25(5.0)	35(7.0)	119(23.8)	225(45.0)	51(10.2)	45(9)	455	3.53	6 th
Sizes of bedrooms in your housing unit	21(4.2)	77(15.4)	72(14.4)	264(52.8)	56(11.2)	10(2)	490	3.52	7 th
Location of wardrobes in the bedrooms	20(4.0)	55(11.0)	113(22.6)	238(47.6)	51(10.2)	23(4.6)	477	3.51	8 th
Quality of fresh air in the living area	25(5.0)	71(4.2)	100(20.0)	216(43.2)	74(14.8)	14(2.8)	486	3.50	9th
Number of staircases in the building	22(4.4)	62(12.4)	93(18.60	231(46.2)	51(10.2)	41(8.2)	459	3.49	10 th
Size of living in your housing unit	19(3.8)	71(14.2)	101(20.2)	214(42.8)	63(12.6)	32(6.4)	468	3.49	11 th
Quantity of natural lighting in corridors and lobbies	27(5.4)	50(10.0)	110(22.0)	238(47.6)	48(9.6)	27(5.4)	473	3.49	11 th
Quantity of natural lighting in the living area	23(4.6)	63(12.6)	111(22.2)	225(45.0)	54(10.8)	24(4.8)	476	3.47	12 th
Design of staircase (if any)	19(3.8)	63(12.6)	105(21.0)	217(43.4)	43(8.6)	53(10.6)	447	3.45	13 th
General design of your housing unit	17(3.4)	80(16.0)	100(20.0)	238(47.6)	43(8.6)	22(4.4)	478	3.44	14 th
Quality of fresh air in the bedrooms	36(7.2)	74(14.8)	88(17.6)	222(44.4)	59(11.8)	21(4.2)	479	3.41	15 th
Type of house/ housing unit occupied	15(3.0)	87(17.4)	114(22.8)	211(42.2)	48(9.6)	25(5.0)	475	3.40	16 th

Table 1 Continued

Level of privacy in your housing unit	35(7.0)	77(15.4)	88(17.6)	222(44.4)	56(11.2)	22(4.4)	478	3.39	17 th
Overall size of your housing unit	23(4.6)	83(16.6)	108(21.6)	220(44.0)	48(9.6)	18(3.6)	482	3.39	17 th
Internal arrangement of spaces in your housing unit	18(3.6)	88(17.6)	105(21.0)	228(45.6)	36(7.2)	25(5)	475	3.37	18 th
Quantity of natural lighting in the kitchen	29(5.8)	87(17.4)	95(19.0)	228(45.6)	43(8.6)	18(3.6)	482	3.35	19 th
Quantity of natural lighting in staircase areas	36(7.2)	57(11.4)	120(24.0)	204(40.8)	43(8.6)	40(8.0)	460	3.35	20 th
Quantity of natural lighting in the dining area	35(7.0)	70(14.0)	127(25.4)	201(40.2)	42(8.4)	25(5.0)	475	3.31	21 th
Number of bedrooms in your housing unit	27(5.4)	122(24.4)	67(13.4)	218(43.6)	50(10.0)	16(3.2)	484	3.29	22 nd
Quantity of natural lighting in toilets/ bathrooms	29(5.8)	83(16.6)	126(25.2)	204(40.8)	38(7.6)	20(4.0)	480	3.29	23rd
Size of wardrobes / walk –in closets	36(7.2)	96(19.2)	98(19.6)	224(44.8)	37(7.4)	19(3.8)	491	3.26	24 th
Quality of fresh air in the dining area	41(8.2)	75(15.0)	147(29.4)	171(34.2)	45(9.0)	21(4.2)	479	3.22	25 th
Quality of fresh air in the kitchen	35(7.0)	115(23.0)	102(20.4)	79(35.8)	50(10.0)	19(3.8)	481	3.20	26 th
Sizes of Sit-outs / terraces in your housing unit	42(8.4)	76(15.2)	147(29.4)	160(32.0)	40(8.0)	35(7.0)	465	3.17	27 th
Size of corridor/lobbies	45(9.0)	106(21.2)	97(19.4)	218(43.6)	25(5.0)	18(3.6)	491	3.15	28 th
Size of Children's play area in your housing unit	48(9.6)	85(17.0)	130(26.0)	169(33.8)	40(8.0)	28(5.6)	472	3.14	29 th
Location of sit-outs and terraces in your housing unit	56(11.2)	73(14.6)	143(28.6)	154(30.8)	44(8.8)	30(6.0)	470	3.12	30 th
Size of dining space in your housing unit	48(9.6)	105(21.0)	117(23.4)	164(32.8)	37(7.4)	29(5.8)	471	3.08	31st
Number of toilets/bathrooms in your housing unit	55(11.0)	130(26.0)	76(15.2)	178(35.6)	45(9.0)	16(3.2)	484	3.06	32nd
Size of study area in your housing unit	74(14.8)	83(16.6)	32(26.4)	138(27.6)	39(7.8)	34(6.8)	466	2.97	33rd
Size of kitchen and store in your housing unit	78(15.6)	129(25.8)	92(18.4)	148(29.6)	38(7.6)	15(3.0)	485	2.87	34 th
Size of store in your housing unit	94(18.8)	122(24.4)	11(22.2)	15(23.0)	24(4.8)	24(4.8)	476	2.73	35 th

1= Very dissatisfied 2= Dissatisfied, 3= Not Sure, 4=Satisfied, 5= Very Satisfied

N(%)

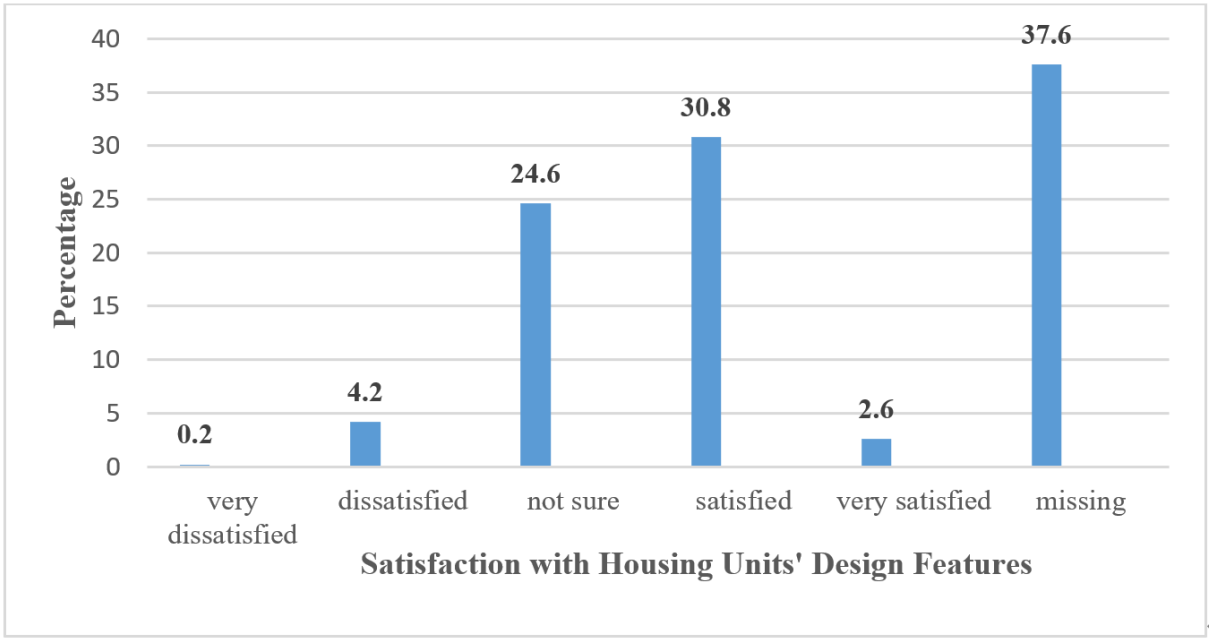

Figure 1. Residents' Overall Satisfaction Housing Unit design features

Regarding the residents' overall satisfaction with housing units' design features, the results indicate that although the highest proportion (37.6%) did not report on this, 33.4% of them were generally satisfied with their dwelling units' design features, 24.6% were not sure of their level of satisfaction, while 4.4% claimed that they were not satisfied with these aspects of their housing units (Figure 1).

Dimensions of Residents' Satisfaction with Housing Unit Design Features

Table 3. KMO and Bartlett's Test for Residents Satisfaction with Housing units' design features

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.940
Bartlett's Test of Sphericity	Approx. Chi-Square	8491.235
	df	666
	Sig.	0.000

The result of the KMO test returned a value of 0.940 and Barlett's sphericity (chi square) of 8491.235 and p<0.000) (Table 3). The KMO value of 0.944 which is above the minimum required value of 0.60 and the Barlett's sphericity (chi square) was significant at p<.005. These imply that the data set for residents' satisfaction with housing units' design features is suitable for factor analysis.

Table 4 shows the factors extracted from the PCA, the percentage of variance contributed by each factor/component and the cumulative percentage accounted for. From the results seven components accounting for around 61.27% variance in all the 37 variables investigated were extracted. The extracted factors were highly correlated and have eigen value above one (e>1) (Table 4). The seven components extracted indicate main ways/dimensions the residents understood and interpreted satisfaction with the design of their dwelling units in the housing estates investigated in this research.

Table 4. Components Extracted from the PCA of Residents Satisfaction with Housing units' design features

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.068	38.022	38.022	14.068	38.022	38.022	5.154	13.931	13.931
2	1.948	5.264	43.285	1.948	5.264	43.285	3.602	9.735	23.666
3	1.740	4.703	47.988	1.740	4.703	47.988	3.230	8.730	32.396
4	1.545	4.175	52.163	1.545	4.175	52.163	3.004	8.118	40.513
5	1.244	3.361	55.525	1.244	3.361	55.525	2.803	7.576	48.090
6	1.089	2.943	58.468	1.089	2.943	58.468	2.712	7.330	55.420
7	1.036	2.800	61.268	1.036	2.800	61.268	2.164	5.849	61.268
8	.966	2.611	63.879						
9	.900	2.432	66.312						
10	.835	2.257	68.568						
11	.784	2.120	70.688						
12	.777	2.099	72.788						
13	.691	1.867	74.655						
14	.654	1.767	76.422						
15	.631	1.705	78.127						
16	.615	1.663	79.791						
17	.546	1.476	81.266						
18	.535	1.445	82.711						
19	.509	1.375	84.086						
20	.477	1.290	85.377						
21	.467	1.263	86.640						
22	.433	1.170	87.810						
23	.422	1.140	88.950						
24	.404	1.093	90.042						
25	.380	1.026	91.068						
26	.351	.950	92.017						
27	.347	.939	92.956						
28	.339	.915	93.872						
29	.323	.873	94.745						
30	.305	.823	95.568						
31	.286	.773	96.341						
32	.279	.754	97.096						
33	.262	.708	97.804						
34	.228	.617	98.421						
35	.218	.590	99.011						
36	.187	.504	99.515						
37	.179	.485	100.000						

Variance accounted for =61.27%

Furthermore, Table 5 shows the suggested names and factor loadings for each of the seven components extracted from the PCA. The first component /dimension which accounts for around 13.93% of the variance in the 37 variables included in the PCA is the quantity of natural lighting and ventilation of interior spaces. It has nine items (variables) loaded on it. The second dimension is the number, design and location of staircases, sizes and location of corridors, wardrobes and location of bedrooms, which accounted for around 9.74% of variance in all the 37 variables and has six items loaded it, followed by third dimension- Sizes of store, kitchen and dining and location of terraces counting for 8.73% of the variance in all the variables and has four factors loaded on it. The fourth dimension is privacy, general design of housing units, number of toilets and location of housing units in the estates, having four items loaded on it and accounting for around 8.12% of the variance in all the 37 variables included. There is also the fifth dimension: Size and type of housing unit, number and size of bedrooms, contributing around 7.58% of the variance in all the variables with another four items loaded on it. Next is the sixth dimension, Size of study, children's play area and terraces and natural ventilation of bedrooms and kitchen which also has four variables loaded on it and accounts for around 7.33% of the variance in all the 37 variables included, while the last dimension is headroom, location of entrances and exits and size of living area, which accounted for 5.85% of the variance in all the variables investigated with three items loaded on it. It is important to mention that out of the 37 variables included in the PCA, two, namely; the number of toilets/bathrooms in your housing units and location of bedrooms in your housing units were not loaded on any of the seven components/dimensions extracted from the PCA. Nonetheless, the seven dimensions or components identified are considered the most important ways in which the residents evaluated satisfaction with the design of their housing units in the estates.

Table 5. Suggested Names and Factor Loadings for seven Dimensions Extracted from the PCA on residents' satisfaction with housing units' design features

Rotated Component Matrix[a]							
	Component						
	1	2	3	4	5	6	7
Dimension 1: ***Quantity of natural lighting and ventilation of interior spaces***							
Quantity of natural lighting in the bedrooms	**.728**	.184	.162	.202	.162	.013	.135
Quantity of natural lighting in toilets/ bathrooms	**.700**	.024	.090	.124	.384	.097	.070
Quantity of natural lighting in the living area	**.663**	.250	.201	.175	.104	.063	.164
Quantity of natural lighting in the kitchen	**.650**	.161	.069	.092	.425	.203	.047
Quantity of natural lighting in the dining area	**.639**	.252	.262	.208	.067	.114	.130
Quantity of natural lighting in corridors and lobbies	**.611**	.251	.145	.315	-.045	.112	-.058
Quality of fresh air in the living area	**.600**	.148	-.012	.053	.163	.379	.247
Quality of fresh air in the dining area	**.580**	.159	.194	-.005	.129	.451	.171
Quantity of natural lighting in staircase areas	**.530**	.276	.081	.120	.011	.250	.210
Dimension 2***: Number, design and location of staircases, sizes and location of corridors, wardrobes and location of bedrooms***							
Number of staircases in the building	.132	**.760**	.089	.015	.054	.063	.150
Design of staircase (if any)	.145	**.641**	.010	.014	.260	.147	.236
Location of the staircase(s) (if any)	.332	**.628**	.150	.184	-.162	-.005	.194
Size of corridor/lobbies	.220	**.621**	.152	.177	.281	.137	.041
Location of wardrobes in the bedrooms	.234	**.494**	.300	.355	-.091	.170	.014
Size of wardrobes / walk –in closets	.256	**.491**	.314	.131	.265	.300	-.027
Location of bedrooms in your housing unit	.310	.424	.077	.309	.161	.022	.170
Dimension 3: ***Sizes of store, kitchen and dining and location of terraces***							
Size of store in your housing unit	.194	.075	**.768**	.082	.049	.278	-.003
Size of kitchen and store in your housing unit	.175	.078	**.750**	.137	.275	.154	.155
Size of dining space in your housing unit	.130	.216	**.701**	.136	.200	.105	.219
Location of sit-outs and terraces in your housing unit	.258	.391	**.488**	.269	-.007	.218	-.017

Table 5 Continued

Dimension 4: ***Privacy, general design of housing units, number of toilets and location of housing units in the estates***							
Level of privacy in your housing unit	.180	-.035	.143	**.646**	.117	.117	.165
General design of your housing unit	.161	.270	.210	**.565**	.329	.115	.137
Internal arrangement of spaces in your housing unit	.185	.227	.247	**.558**	.278	.027	.033
Location of your housing unit within the estate	.131	.268	-.140	**.515**	.190	.125	.258
Number of toilets/bathrooms in your housing unit	.126	.135	.312	**.390**	.385	.348	.013
Dimension 5: ***Size and type of housing unit, number and size of bedrooms***							
Number of bedrooms in your housing unit	.217	-.003	.256	.173	**.710**	.089	.101
Type of house/ housing unit occupied	.173	.226	.014	.345	**.603**	.240	.051
Sizes of bedrooms in your housing unit	.231	.158	.256	.129	**.519**	.055	.463
Overall size of your housing unit	.245	.238	.168	.270	**.467**	.361	.241
Dimension 6: ***Size of study, children's play area*** **and terraces and natural ventilation of bedrooms and kitchen**							
Quality of fresh air in the kitchen	.398	.125	.201	-.010	.267	**.617**	.072
Size of study area in your housing unit	.038	.158	.293	.312	.123	**.590**	.079
Size of Children's play area in your housing unit	.195	.038	.194	.475	.065	**.545**	.059
Quality of fresh air in the bedrooms	.460	.169	.129	.079	.125	**.531**	.200
Sizes of Sit-outs / terraces in your housing unit	.270	.132	.319	.371	-.019	**.381**	.284
Dimension 7: ***Headroom, location of entrances and exits and size of living area***							
Ceiling height (headroom)	.173	.284	.068	.116	.092	.229	**.716**
Location of entrance and exit doors	.323	.136	.128	.353	.062	.143	**.653**
Size of living in your housing unit	.128	.227	.425	.141	.362	-.108	**.513**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 9 iterations.

5. Discussion

With regards to the respondents' satisfaction with housing unit design features, the findings revealed that they were most satisfied with location of bedrooms in their housing units, location of entrance and exit doors, ceiling height (headroom), location of their housing units within the estate, quantity of natural lighting in the bedrooms, and location of the staircase(s) (if any). While they expressed the least satisfaction with the location of sit-outs and terraces in their housing unit, size of dining spaces, number of toilets/bathrooms, sizes of study area, kitchen and store. In terms of their levels of satisfaction with the housing unit design features, a majority of the respondents indicated that they were satisfied. This finding is in support of the previous research by Aigbavboa and Thwala [18] who revealed that residents in low-income housing scheme in Gauteng Province of South Africa indicated their satisfaction of the spatial features in their dwellings, but were not satisfied with the available social characteristics, except for safety in the environment and that by Alnsour and Hyasat [22] who reported that in Salt city, Jordan, residents reported that their satisfaction level was linked to such housing design features like privacy and floor area (i.e. size of dwelling units). These findings also corroborate that Ibem et al. [2] show that most residents of low-cost public housing constructed between 2003 and 2009 in Ogun State, Nigeria were satisfied with their housing unit features. In addition to that, Phillips et al. [25] in Hong Kong revealed that the interior as well as exterior characteristics of the dwelling units, and concern for security had the strongest tie with residential satisfaction. However, the findings contradict that by Ukoha and Beamish [23] who reported that residents of public housing in the Federal Capital Territory-Abuja, were dissatisfied with the physical and spatial characteristics of their dwelling units and those by Mohit and Azim [24] who also reported that a majority of the residents in public housing in Hulhumale, Maldavies, were least satisfied with the physical spaces within their dwelling units. The contrary result can be linked to differences in the context of the research, socio-economic characteristics of the respondents and the variables included in the study by Ukoha and Beamish [23] and Mohit and Azim [24].

From the results of the PCA for the variables used to investigate the respondents' satisfaction with housing units'

design features, it was found that the respondents in the survey understood and interpreted satisfaction with housing units' design features in seven different ways. These are : 1) quantity of natural lighting and ventilation of interior spaces 2) number, design and location of staircases, sizes and location of corridors, wardrobes and location of bedrooms 3) sizes of store, kitchen and dining and location of terraces 4) privacy, general design of housing units, number of toilets and location of housing units in the estates 5) size and type of housing unit, number and size of bedrooms 6) size of study, children's play area and terraces and natural ventilation of bedrooms and kitchen and 7) headroom, location of entrances and exits and size of living area. These results indicate that these are the most important aspects of housing units' design features, which are responsible for the resident's levels of satisfaction with housing provided under the housing scheme in the study area. The implication of this is that the residents of the estates will more likely be satisfied with housing unit design features if quantity of natural lighting and ventilation of interior spaces are given adequate attention at the development and operation phases of the estates. The dimension with the lowest influence is the seventh, which is related to headroom, location of entrances and exits and size of living area. This suggests that the residents' bother is less about headroom, location of entrances and exits and size of living area in their perception of how their housing units are meeting their needs, expectations and aspirations. Therefore, architects involved in the design of mass housing units should ensure that they give priority attention to these aspects especially the top three dimensions in the design practice to enhance residents' satisfaction with their dwelling units features.

6. Conclusions and Recommendations

The study investigated the Satisfaction with neighborhood physical environment of the Public Sector Employee Housing Schemes in Lagos State, Nigeria. Therefore, these subsequent two focal conclusions are made. First, the results specifically show that the top three housing unit design features the residents were most satisfied with were location of bedrooms, location of entrance and exit doors and ceiling heights (headroom), while they were least satisfied with Size of study area in your housing unit, Size of kitchen and store in your housing unit, Size of store in your housing unit. Second, the seven main dimensions of housing design features satisfaction were quantity of natural lighting and ventilation of interior spaces; number, design and location of staircases; sizes and location of corridors, wardrobes and location of bedrooms, sizes of store, kitchen and dining and location of terraces; privacy, general design of housing units, number of toilets and location of housing units in the estates; size and type of housing unit, number and size of bedrooms; size of study, children's play area and terraces and natural ventilation of bedrooms and kitchen; headroom, location of entrances and exits and size of living area Therefore, to ensure that neighborhood Physical environment contributes maximally to public sector employee housing scheme, stake holders involved in the design and development of housing should pay sufficient consideration to the features identified in this study.

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