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Design Implications: Impact of Socio-Physical Setting on Public Housing Transformation in Nigeria

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Abstract

Scholars claim physical surroundings as concrete manifest of space organisation. Its arrangement delineates spatial relationship of social activities' network within housing units. Yet, housing challenges in Nigerian cities portray minimal sensitivity to socio-physical attributes impacting public housing adjustments. Focusing on users' adjustments experience and emphasising on socio-physical environmental impact, public housing dwellers were examined to ascertain the socio-physical impact on housing adjustments initiatives. A survey with 276 households conducted in ten public housings in northern states of Nigeria, evaluated users' experience on socio-physical model of housing adjustment. Features of Building attributes; Neighbourhood influence; Technology; Plot size and Quality of urban living

standards were explored using questionnaire forms and analysed by SEM. The result shows significant influence of socio-physical constituents on homeowners housing adjustment decisions. This implies the need to review design policies and developers culture responsive design innovative initiatives harmonising the emic and etic paradigms based on user desires.

Keywords: Culture, Design Implications, Public Housing, Socio-Physical, Transformation

1. Introduction

Spatial arrangement of buildings cannot be isolated from the impact of physical environment. However, the relationship between the duos is reinforced by the social atmosphere underlying its existence. This is in agreement with the paradigm of environmental determinism, which acknowledges physical environment to effect users' behaviour (Vischer, 2008). Thus, contextually; public housing domain as a physical entity significantly responds to social adjustments in fulfilling both functionality role and satisfying users' desire. Additionally, earlier studies have associated the ineffectiveness witnessed in Nigerian physical development to financial incapability, weak organisational structure and poor public enlightenment (Alabi, 2010). Conversely, it has also been faced with distortion due to unguided housing adjustment in bid of culture inclusion by residents. Consequently, unrestrained developmental schemes are common and continue to exist (Chokor, 2005) with fresh cases springing up around new estates. These impacts on the physical environment in most situations are devoid of professional guidance. Remarkably, these actions are viewed as violations, and little research exists in addressing the potentials of housing adjustment trends as it impacts on the physical environment. In view of these, factors of Plot size (PS), Building attributes (BA), Quality of urban living (QAUL), Technology (T) and Neighbourhood influence (NI) having being derived from background studies was used in examining the significance of socio-physical attributes of users' experience in public housing adjustment.

Researchers have asserted that housing adjustment promotes housing satisfaction not only by facilitating the inclusion of occupants' culture, but also by incorporating their changing limitless needs and desires. This is because housing adjustment remains inevitable as the needs and desires which are basic to households' existence remain dynamic (Seek, 1983). According to the disequilibrium model of (Clark and Ledwith, 2005) on residential mobility, households continue to stabilise their housing demand with available options. Although he argued in favour of housing mobility for alternative options, existing choice could be housing adjustment, which is often preferred by most residents (Seek, 1983). Thus, the ability to retain stability and regain equilibrium after the shift by demographic and socio-economic forces drives the motivation in housing adjustment choices (Khan, 2014b). Therefore, housing adjustment in public housings is more likely to be critical as initial designs are usually devoid of the occupants' involvement and are homogenous. Household structure and socio economic factors differ and changes, suggesting dynamism in living and most often reflected in built spaces. Giving the impossibility of retaining homogenous units' design of public housing beyond its occupation, developers have to rethink design strategy in order to meet with future homeowners' challenges. In particular, is the need to check unguided adjustments that distort physical organization and promote unhygienic environment which negates the essence of public housing initiatives (Ademiluyi, 2010).

Although, previous researchers (Daramola, 2006; Ikejiofor, 1999) have claim the need to re-assess the socio-physical environment of public housing in Nigeria, little empirical research on underlying socio-physical factors that influence public housing adjustment motives exist. The impact of socio-physical factors in the adjustment choice making by public housing residents in northern states of Nigeria is therefore crucial and explored by this

study. Statistical analysis of Likert scaled survey questionnaire adopted in obtaining users' experience of adjustment choice making, focusing on socio-physical attributes revealed significant manifestations. The outcome reflects technology as most significant factor influencing choice making. Similarly, inadequate habitable rooms, social ties with peers and previous urban living experiences are most significant attributes that underlie homeowners' decision in housing adjustment. These findings imply that developers have to consider the natural dynamics of public housing to homeowners and facilitate guided forecast of future adjustments at the inception of design process and also, direct regulatory agencies in policy formulation.

2. Background

2.1 Impact of socio-physical setting

Socio-physical setting could be described as tangible context where social activities are accommodated. Successful configurations are achieved through effective and efficient integration of social and physical phenomena which increases user satisfaction. Thus, housing features and physical environment account for higher user satisfaction (Türkoğlu, 1997). Because, they unite activities with spaces defining patterns and facilitating human existence. The persistence of indigenous social patterns on homogenous physical setting such as public housing is re-orienting the meaning and ideals of public housing in the Nigerian context. As a result, social activities are identified to exist outside spaces designed for them or outside the entire initial configuration (Rosow, 1961). Moreover, scholars have argued on the understanding that function dictate space use, likewise inversely space dictates what function to accommodate. The latter is a complex concept that deviates from identifying spaces by the function they host. While the first concept is common with modern designs the second is imbedded in indigenous housing planning. However, inherent in architectural forms, social meanings are significant in shaping the physical environment (Hillier et al., 1984). Hence, the use of space is realistically predestined and distinctly distinguished among people due to cultural diversity (Harvey, 2010). There by, enabling the understanding of groups of people with their ways of living. Therefore, space is actively connected to social life, and is a factor of human existence as conceived in social theory (Hillier, 2008). For instance, house type offers stable physical setting that fits social life, metaphorically described as gloves fit hands and the most widely shared experience in a culture (Habraken, 1988). Then social behaviour exhibited by space can only be comprehended principally by the value of its potential to act in space as a phenomenon (Hillier, 2008). As a result, spatial organisation, spatial elements and how spaces relate to one another are powerful approach of distinguishing housing typology other than by functionality (Habraken, 1988). In effect, meaningful understanding of cross-cultural physical and social relationship is required (Harvey, 2010). Public housing adjustment phenomenon offers potential platform in understanding cross-cultural physical and social association.

2.2 Public housing transformation

This phenomenon constitutes changes imposed on initial units' layout of homogenous neighbourhood's residential houses converting it into transformed heterogeneous units. In

effect, public housing efficacy is enhanced which in turn facilitates homeowners' benefit in public housing adjustments exercise (Seek, 1983). Impliedly, housing satisfaction could be derived with increase in the value of housing performance while housing shock and housing stress are addressed. Specifically, is the fulfilment of lifelong aspirations which varies with households irrespective of their lifecycle (Khan, 2014a) making housing adjustment inevitable and part of life process. Thus, houses are viewed more as living entities than physical behavioural patterns (Khan, 2014b). However, while housing transformers target the fulfilment of socio-spatial pattern and benefiting from the potentials in housing adjustment, regulating authorities are hostile in responding to their attitudes (Tipple, 1996). Their actions are viewed merely as contravening existing regulations. Conversely, the motivational persistence of homeowners could be associated with irresistible benefits achieved through housing transformation that may be harnessed as potentials in the process of sustainable housing provision. For instance, relieving homeowners of housing shock due to increased household size or housing stress as a result of changing space needs improves liveability. These are benefits in housing consumption that cannot be ignored, because both shock and stress often result from changing family structure which influences housing adjustment (Tipple, 2000). Again, in maximizing homeowners' benefit the social phenomenon of housing adjustment and the physical setting adjusted requires adequate comprehension. Thus, both the initial design and the transformed layout represent the path that provides the adjustment transition hence an impact on initial design layout.

2.3 Design inferences

Housing design and size are established to be significant in influencing housing satisfaction (Türkoğlu, 1997). Standardised homogenous designs as in mass housing units and neighbourhoods restricts liveability, with contrast between "specific spaces" designed for "specific purposes" and non-conformity of usage (Rosow, 1961). The stance in modern perception of designing space for the function it holds contrasts with indigenous insight where spaces are identified with name and not by function (Habraken, 1998). Usually such spaces accommodate series of activities.

Recent trends in public housing transformation arouse the need for harmonising the two standpoints in order to sustain housing delivery among the lower class. Under these circumstances, linking space configuration with social meanings analysed via grounded and natural visions should develop inventive values of several insights (Bafna, 2012). Because, previous users' experience coded as the spatial reasoning in transforming the built environment consist of the spatial knowledge that guides spatial decisions (Harvey, 2010). Therefore, developing spatial knowledge from users' experiences determines the concept of association between space configuration and social meaning in future housing design. In effect, conflicts in emerging spaces and social activities are identified and resolved. Research has recognised the critical role of design expectation (Zinas and Jusan, 2012) as motivators of homeowners in housing adjustment. Hence, the study proposes Building attribute, Plot size, Neighbourhood features, Quality of Urban Standards and Technology as salient attributes in explaining socio-physical motivation of homeowners in public housing adjustment.

Previous studies such as (Khan, 2014a; Seek, 1983; Tipple, 2000) have adopted conceptual, qualitative and statistical approaches to evaluate housing adjustment phenomenon, in addition to identifying physical features as vital determinants in housing adjustment that defines the nature of improvements. This study however, contributes to the advancements of public housing adjustment by first concurrently examining the effect of both latent factors and measurement attributes. Second, proposing a composite model that combines latent factors to illustrate the relationship between the constructs and establishing factors that most significantly influence homeowners' decision.

2.4 Research model and hypothesis

The study developed a research model by relating factors of socio-physical attributes of public housing adjustment in a composite analysis. The research model fig 1 was achieved after subjecting variables of the constructs to psychometric analysis and model fitness was achieved.

2.5 Socio-Physical determinants

Urban spatial paradigm desires spatial quality for the low income dwellers (Makachia, 2011). The value associated with reflecting the paradigm in providing housing for low and medium income class are most often challenging. Housing in its spatial organisation is fundamental to the physical system around it (Habraken, 1988). Accordingly, the physical features of an environment have significant impact on users' perception and connection with space (Harvey, 2010). Previously, Türkoğlu (1997), examined the effect of neighbourhood features on residents' satisfaction with positive impact. Also, building attributes in public housing should consider underlying diversity in culture, changing family structure and socio-economic status of users (Ukoha and Beamish, 1997). Since, spatial changes of Nigerian architecture are attributed to civilization, cultural infiltration and technological advancement due to social changes; by shift in community and family values to western ways of life (Rikko and Gwatau, 2011). Then, space organisation often mismatch with users' activities in public housing design but only satisfy immediate needs, as a result users embark on rapid transformation in accordance with their lifestyle and preferences (Wong, 2010).

Kaya (2004) highlighted sequentially, previous works that established communication gap between users, designers and building owners at inception. He recognised while suggesting systematic research on the needs of end-users. Similarly, Arimah (1992) recognised room size and plot size as attributes of housing demand in Nigeria. Land for homeowners to construct their houses is not easily accessible, (Arimah, 1997), although large areas of land are subdivided into plots sizes and sold to prospective developers. In contrast initial public housing constructions favour some homeowners as they benefit more un-built area around their acquired unit in public housing setting. A disparity that is reflected in the nature and scale of changes embarked upon by homeowners. Equally, existing empirical research suggests that neighbourhood environment significantly influence family characteristics and wellbeing (Ellen and Turner, 1997; Ukoha and Beamish, 1997). Also, Rent and Rent (1978) found neighbourhood physical and social setting significant in low income housing satisfaction. Hence, the following hypothetical paths are proposed in establishing

socio-physical composite model that influences homeowners' adjustment decisions.

H1= BA-SPE; Building attribute positively influence homeowners decision on housing adjustment

H2= PS-SPE; Plot size positively influence homeowners decision on housing adjustment

H3= NF-SPE; Neighbourhood features positively influence homeowners' decision on housing adjustment

H4= QULS-SPE; Quality of urban living standard positively influence homeowners decision on housing adjustment

H5= T-SPE Technological advancement positively influence homeowners decision on housing adjustment

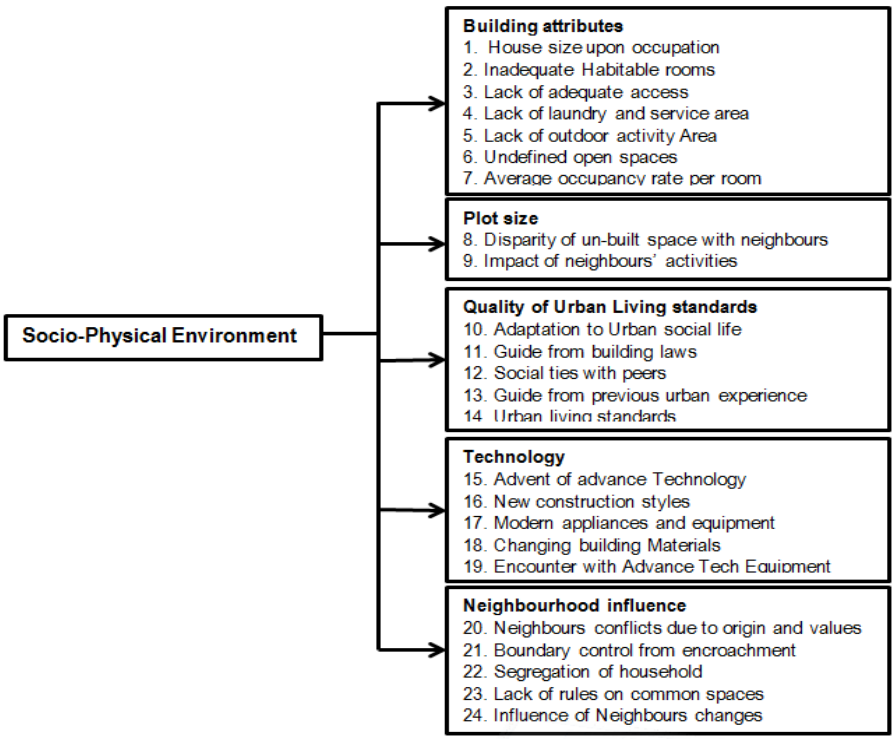

Figure 1. Proposed Socio-physical environment composite structural model

3. Method

Factors established from previous researches were adapted in developing the instrument for the study. Consequently, survey questionnaire with structured 5 point Likert scale questions (with scaling range from strongly agree to strongly disagree) were used to examine homeowners experience in public housing adjustment. Stratified conditional sample was adopted in selecting housing estates across the region for the study. Purposively, 10 samples of housing estates across northern states of Nigeria are chosen for survey in assessing the phenomena. The selection criteria considered the age of the estate which should range between three (3) and fifty (50) years of existence, multi-ethnic community, located in the

state capitals for equal scaling and presently occupied on owner occupier basis. A total 276 questionnaire forms returned from hand delivery representing about 93% of surveyed respondents; and meeting the sample size requirement for SEM analysis (Hair Jr et al., 2010) were used for analysis after eliminating those wrongly filled and those with incomplete information.

To explore the significance of the phenomenal construct of socio-physical attribute in housing adjustment choices, series of psychometric analysis are conducted. First, factor analysis was conducted in order to identify the significance of the multiple item attributes used in measuring the factors in construct after establishing these factors from background studies. Second, confirmatory factor analysis was performed in order to establish the strength and association of the factors constituting the construct in the phenomenal relationship. Finally, regression analysis was conducted to ascertain the level and strength of the factors in influencing housing adjustment decisions.

4. Result and Discussion

Exploratory factor analysis was conducted on strong factors and the significant factors correlated in order to determine the rate of association among the factors;

4.1 Factor Analysis

The strength of the factors were determined through factor analysis, consequently 28 item attributes grouped into five factors were analysed. Building attributes consists of eight (8) item scale used in assessing the influence of housing features; Plot size comprise of five (5) item scale used in measuring the impact of un-built area on adjustment decisions; Neighbourhood influence/features consists of five (5) item scale that examined the influence of neighbours in housing adjustment decisions by homeowners; Quality of urban living standards examined urban experiences, peer influence building laws and standardization with five (5) item scale while Technology consists of five (5) item scale and assessed residents' encounter with modern appliances and equipment in transformation decisions. Items with value ≤ 0.39 loading coefficients were termed weak in the construct and not considered for further analysis. Table 1 shows the factor loadings with those not considered for further analysis in italic fonts.

Table 1. Exploratory Factor Analysis (EFA) of Socio-Physical Environmental

Building attribute		Plot size		Neighbourhood features		Quality of Urban standards		Technology	
Item 1	.647	Item 9	.596	Item 14	.696	Item 19	.691	Item 24	.728
Item 2	.635	Item 10	.573	Item 15	.691	Item 20	.597	Item 25	.698
Item 3	.603	Item 11	.446	Item 16	.530	Item 21	.574	Item 26	.646
Item 4	.580	*Item 12*	.342	Item 17	.496	Item 22	.499	Item 27	.572
Item 5	.564	*Item 13*	.331	Item 18	.474	Item 23	.463	Item 28	.571
Item 6	.482								
Item 7	.472								
Item 8	.041								

4.2 Confirmatory Factor Analysis

Next, 25 item attributes that manifested ≥.40 coefficient in the factor constructs were considered significant for further analysis. Consequently, confirmatory factor analysis was conducted and item attributes are further examined in their loading coefficient, with the measurement model subjected to reliability and validity analysis the determination of model fitness. Table 2, presents the correlation path coefficients which ranges from 0.29 to 0.74. Although the path coefficients show significant association of factors, there are weaker associations with low coefficient values. Therefore, the correlation result shows the tendency of weak association of some paths which appears to have weak coefficient values, an indication that those factors do not strongly associate in influencing homeowners' decision. However, since the correlation coefficients are lower than 0.85 in value discriminant validity was achieved and the constructs were considered for further structural model analysis. Quality of urban living associates well with both Technology and Neighbourhood influence. The research therefore argues on the premise that similar home use appliances common among neighbourhoods would have overtime been acquainted to by households through neighbourhood interactions. The benefits so derived then influences spatial changes by other users in order to attain the same status level in the society.

Table 2. Correlations Analysis

Correlated Paths' relationship			Estimate
Building Attribute	<-->	Quality of Urban Living	.286
Building Attribute	<-->	Technology	.302
Building Attribute	<-->	Neighbourhood Influence	.411
Plot Size	<-->	Quality of Urban Living	.434
Plot Size	<-->	Technology	.565
Plot Size	<-->	Neighbourhood Influence	.531
Quality of Urban Living	<-->	Technology	.738
Quality of Urban Living	<-->	Neighbourhood Influence	.629
Building Attribute	<-->	Plot Size	.323
Technology	<-->	Neighbourhood Influence	.495

4.3 The Structural Model

The Structural model fitness was achieved with normed X2 equals 2.38 (X2 =588.75,df =247) which falls within the threshold of 3 suggested by (Bagozzi and Yi, 1988) indicating a perfect fit. The goodness of fit indices also exhibited good fit for the structural model with GFI of 0.81, while the comparative fix index CFI is 0.81. Both are within the suggested margin of 0.8 (Browne and Cudeck, 1992; Chau and Hu, 2001). In addition, the root mean square error of approximation RMSEA = 0.070, below the threshold of 0.08 suggested by (Browne and Cudeck, 1992; Steiger and Lind, 1980) and indicating a good fit. Consequently, the structural model exhibited fairly good fit with the sample data considering the given parameters particularly with the consideration of at least a fit index from each category of absolute, incremental and parsimonious fit indexes (Hair Jr et al., 1995; Holmes-Smith et al., 2006).

4.4 Regression Analysis

The significance of the social physical environment in influencing users' public housing adjustment was examined with five latent constructs as indicated on the model (see fig 1). The regression weight indicates coefficient loadings >0.5 thus considered good indicators (Pedhazur and Schmelkin, 1991) while the p-values shows all attributes to be significantly different from zero at the 0.01 level (two tailed) thus, supporting the hypothesis H1-H5 of the factors being positively significant in influencing homeowners adjustment decisions. The quest for additional habitable rooms appears most significant feature considered in building attributes. This suggests that the available rooms in public housings are not in consonant with the family structure, therefore increasing the occupancy rate which in turn builds up overcrowding. Social ties with peers and long bonding with the urban environment demonstrates how acculturation has significantly influence the transformation drive. Above all, the values indicated from the result that generally changing social atmosphere around the physical environment has had impact on public housing dwellers adjustment decisions.

Table 3. Regression Analysis of factors

Hypothesized paths			Estimate	S.E.	Z-Value
Building Attribute	<---	Socio Physical Environment	1.000	Reference point	
Plot Size	<---	Socio Physical Environment	1.801	.415	4.340
Quality of Urban Living	<---	Socio Physical Environment	1.621	.357	4.538
Technology	<---	Socio Physical Environment	2.001	.428	4.678
Neighbourhood Influence	<---	Socio Physical Environment	1.796	.404	4.446

Note: p-value is highly significant at 0.01 (two-tailed) for all co-efficient

Table 4. Regression Analysis of items

Regression relations of item with factors			Estimate	S.E.	Z-Value
House size upon occupation	<---	Building Attribute	1.000	Reference point	
Inadequate Habitable rooms	<---	Building Attribute	1.050	.121	8.678
Lack of adequate access	<---	Building Attribute	.972	.118	8.212
Lack of laundry and service area	<---	Building Attribute	.805	.110	7.295
Lack of outdoor activity area	<---	Building Attribute	.819	.109	7.546
Undefined open spaces	<---	Building Attribute	.693	.103	6.747
Average occupancy rate per room	<---	Building Attribute	.711	.111	6.391
Disparity of un-built space with neighbours	<---	Plot Size	1.000	Reference point	
Impact of neighbours activities	<---	Plot Size	.617	.117	5.258
Adaptation to Urban social life	<---	Quality of Urban Living	1.000	Reference point	
Guide from building laws	<---	Quality of Urban Living	.905	.132	6.835
Social ties with peers	<---	Quality of Urban Living	1.157	.140	8.261
Guide from previous Urban experience	<---	Quality of Urban Living	1.026	.142	7.229
Urban living standards	<---	Quality of Urban Living	.668	.117	5.734
Advent of advance Technology	<---	Technology	1.000	Reference point	
New construction styles	<---	Technology	.827	.082	10.039

Modern appliances and equipment	<---	Technology	.803	.084	9.517
Changing building Materials	<---	Technology	.766	.089	8.566
Encounter with Advance Tech Equipment	<---	Technology	.805	.095	8.487
Neighbours conflicts due to origin and values	<---	Neighbourhood Influence	1.000	Reference point	
Boundary control from encroachment	<---	Neighbourhood Influence	.996	.121	8.213
Segregation of household	<---	Neighbourhood Influence	.719	.099	7.268
No rules on shared spaces	<---	Neighbourhood Influence	.680	.097	6.998
Influence of Neighbour	<---	Neighbourhood Influence	.775	.111	7.016

Note: p-value is highly significant at 0.01 (two-tailed) for all co-efficient

5. Findings

Results from the study indicate that advancement in technology significantly influences homeowners' adjustment decision. This can be attributed to their long-time contact with the urban environment which is reflected in their social ties with peers and established urban experience. Additionally, technology exhibited being most significant attribute in the decision to adjust existing public housing. This finding is in consistence with (Cowan, 1976) who asserted the influence of technology in re-shaping household activities through social changes of the 20th century.

In contrast however, building attributes indicated inadequate habitable spaces for family members. Households are thereby motivated by the inadequacy of rooms to reciprocate with conversions and creating new habitable spaces in meeting with the new demand. The study also found emulation of peers and colleagues to be strongly associated with the impetus to adjust housing to a desired quality of urban living standard. This implies benefiting from other peoples' practices, which they have tested and found to be valuable. Additionally, cumulative previous urban living experiences on the quality of urban standards may have significant impact on homeowners' decision. The result also indicates that long link with the urban environment gradually changes the needs and desires of public housing residents. Consequently, the need arises for a re-think in the physical form of public housing units in Nigeria.

6. Conclusion

Motivated by the need for a paradigm in Public housing design in Nigeria, this study sought to find out design implications in public housing transformation by examining the impact of socio-physical environment on public housing adjustment in Nigeria. The outcome shows that homeowners housing adjustment decisions are significantly impacted by socio-physical environmental factors. Technology has overriding significance to influence, while available un-built spaces enabled the creation of additional habitable spaces to meet changing spatial

needs. However, disparity in plot size determined the extent and scale of additional spaces introduced. Yet, little is observed of the potentials in this trend and utilising transformation benefits for subsequent public housing initiatives.

Also, since little exist on conclusive practical path of operating the benefits of empirical studies on housing transformation of public housing design. This study proposes the considerations of design inferences to be adopted in public housing design. First, as established, developers have to consider prevailing average household occupancy rate in initial design with priority given to size and number of habitable spaces. Second, evolving household appliances and equipment should be considered in determining spatial provision of activity spaces, with flexibility of use rather customize space utilization.

Finally, while this study focuses on examining the latent variables measuring them from the theoretical and statistical frameworks, there is need for detail practical study of the elements that comprise these attributes to ascertain the relative dimension of the components in the factors and by extension socio-physical environment that motivate homeowners which should be considered in the initial design. Further test of the research measurement model with different samples will validate the findings for optimal generalization.

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