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Factors Influencing Transformation of Prototype Public Housing in Northern Nigeria

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[1]Joy Joshua Maina

[1]Directorate of Academic Planning and Monitoring, Ahmsadu Bello University, Zaria
[1]Department of Architecture, Ahmadu Bello University, Zaria
: jjmaina@abu.edu.ng; +(234)9090271277

Abstract

This paper explored factors influencing transformation and their relationship to residential satisfaction within prototype public housing in northern Nigeria as such studies are rare. Transformation increases and improves existing housing stocks in order to address acute housing deficits but exerts enormous pressure on urban infrastructure notably electricity and water supply, waste disposal, drainage and road networks. The study employed mixed methods through observations of transformations within three prototype public estates in Abuja, Sokoto and Potiskum as well as a survey regarding reasons residents transform their houses. Data from 73 respondents were analysed using descriptive statistics and Principal Components Analyses (PCA). Results revealed that the houses were largely allocated to civil servants within the middle to high-income bracket on owner-occupier basis and rarely to the low-income group. Mean satisfaction of 2.99 illustrates that residents were generally dissatisfied with the condition of their dwellings. Transformations were influenced by spatial, structural psychological and institutional factors as the lack of satisfaction with dwelling unit design; increasing housing stock, maintenance, privacy and services; increasing interior/sleeping spaces as well as the need for personalisation most influenced transformations. The latter largely accrued from implementing an owner-occupier policy of housing allocation. Economic reasons and home-based enterprises exerted the least influence on transformations. The implication on practice is that allocation strategies affect transformations within prototype housing thus designs need to be flexible to accommodate inevitable transformations. Public procurement processes also require urgent attention to address the low quality of construction and material finishes within prototype public housing in northern Nigeria. Planning policies will also need to factor in more economic related communal facilities around streets and markets as economic activities were observed to largely occur outside housing units. Urban policy will also benefit from similar studies of transformation within private housing as these constitute the bulk of housing supply in the country.

Keywords: Nigeria, Transformation, Public Housing, Prototype, Satisfaction

1. Introduction

Living within planned environments is a lifetime ambition for many urban residents. In Nigeria, owning a custom-designed house within planned neighbourhoods is difficult at the onset of a person's career especially in public service. Consequently, the owner-occupier policy arguably presents opportunities to achieve personal urban housing goals. Overtime, residents transform these prototype public units for various reasons, which inevitably influence neighbourhood composition, visual appearance as well as urban infrastructure (Tipple, Owusu & Pritchard, 2004). Transformation, often employed interchangeably with modifications in literature, refers to alterations, extensions or remodelling that result in changes to the composition, appearance or character of the building, its envelope or components (Ilesanmi, Jiboye & Morakinyo, 2015). Several reasons necessitate investigations into this phenomenon. First, transformations are inevitable within public housing schemes (Khan, 2014) but official responses have, at best, been tolerant and hostile at worst (Olima & Onyange, 2015). A consequence of such attitudes has been the lack of policy formulation to inform future programmes and mitigate disadvantages observed from transformations. These include overcrowding, decrease in green open areas, traffic congestion especially at peak periods, overstretched services specifically water and electricity supply, poor drainage, delinquency and crime due to slum-like environments, structural overload on existing dwellings as well as sub-standard construction (Makachia, 2005; Tipple et al., 2004). Secondly, housing policies require information from surveys of residents in a bottom-up not top-down approach (Morris, Winter & Murphy, 1998). Unfortunately, there is little housing data and relatively little interest within government in having data suitable for housing policy-making in most parts of Africa (Tipple, 2015). Few studies empirically investigate reasons residents transform public housing units in Nigeria. Specifically, studies holistically investigating factors influencing transformation of dwellings in public estates occur largely in southern regions (Aduwo & Ibem, 2017; Ilesanmi et al. 2015) with comparably little research efforts in the north. Although Isah (2016) and Maina et al., (2016) report transformation trends in parts of northern Nigeria, both studies focused on the effects of sociocultural and psychological influences on transformative efforts by residents. Consequently, little data exists to guide institutional frameworks regarding transformations in northern regions of the country.

This study explores factors which influence transformation of houses as well as satisfaction of residents, delimited to prototype public housing estates in northern Nigeria for two reasons. Public housing attracts huge government intervention as part of government's corporate social responsibility in addressing the housing deficit problem of its increasing populace. In its Economic Sustainability Plan to address COVID-19 pandemic, the Federal Government of Nigeria aimed to construct 300,000 homes to ease bottlenecks in social housing delivery, provide affordable houses as well as to create jobs during the construction process (FGN, 2020). Secondly, the study addresses the dearth of data regarding reasons residents transform dwellings within public estates in northern Nigeria in order to inform policy makers, designers and researchers of trends and areas requiring intervention towards reducing the negative aspects of transformation as well as to improve urban development and management in future.

2. Literature Review

Transformation of residential units is a well-documented phenomenon in literature especially in developing countries in part due to its impact on urban livability and satisfaction with life. Dissatisfaction with current housing is a major attitude proffered in support of residential transformation by occupants. The Housing Adjustment Theory by Morris et al. (1988) posits that when housing fails to meet basic family and/or cultural norms, a housing deficit occurs. When housing conditions fail to meet a reference point for the satisfaction of basic needs, families adapt either by moving to another house, adjusting their family structure (in terms of size for instance) or transforming the house (Figure 1). Families in developing countries are more likely to transform the house rather than move out or adjust their family structure, depending on the socioeconomic characteristics as well as the housing conditions and environment (ibid). Several reasons exist in literature for

dissatisfaction with housing conditions and resulting residential transformation (Table 1). These, though interrelated, are categorised under spatial, structural, psychological, sociocultural, economic and institutional factors.

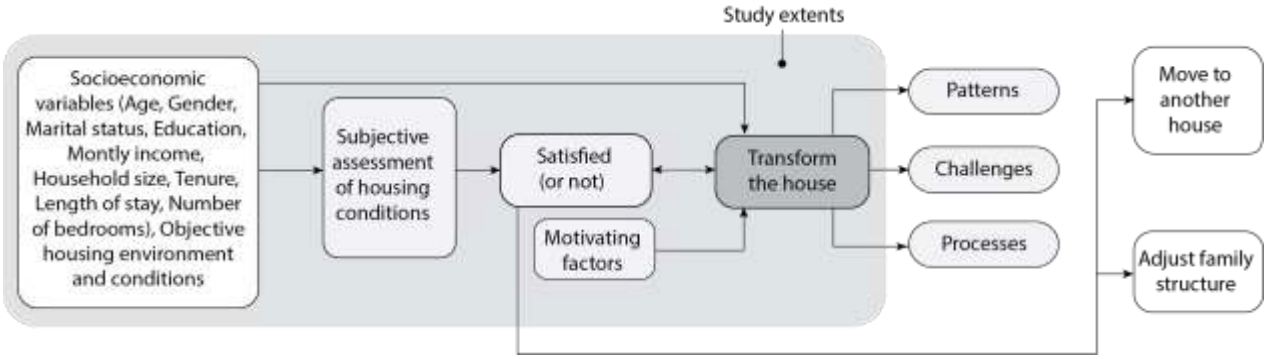

Figure 1: Conceptual framework

Table 1: Factors and reasons influencing housing transformations

Factor	***Reason***	***Sources***
Spatial	Changing family needs	Asa, Lawal & Morakinyo (2018); Morakinyo Ilesanmi & Asa (2018); Aryani, Sasongko & Wahyuningsih (2017); Bukhari (2015); Ilesanmi et al. (2015); Hamid & Mohamed Elhassan (2014); Khan (2014); Aduwo, Ibem & Opoko (2013); Isah (2012); Adegbehingbe (2011); Tanaka et al. (2003); Manalang et al. (2002); Sibley-Behloul (2002); Tipple (1999); Morris et al. (1998)
	Increase in family income	Maina et al. (2016); Hamid & Mohamed Elhassan (2014); Adedayo (2012)
	Functional requirements	Omar et al. (2017); Cil (2007)
Structural	Dissatisfaction with original plan	Asa et al. (2018); Aduwo & Ibem (2017); Aduwo et al. (2013); Maina (2013)
	Dissatisfaction with typology	Bunster & Bustamante (2019); Makachia (2005)
	Poor quality of building materials	Bunster & Bustamante (2019); Hamid & Mohamed Elhassan (2014)
Psychological	Modern trends	Asa et al. (2018); Maina et al. (2016); Nguluma (2003)
	Aesthetics	Aryani et al. (2017); Maina et al. (2016); Ilesanmi et al. (2015)
	Status symbol	Maina et al. (2016); Aduwo et al. (2013); Isah (2012)
	Territoriality	Asa et al. (2018); Adedayo (2012); Makachia (2005)
	Personalisation	Asa et al. (2018); Khan (2014); Sibley-Behloul (2002)
	Security	Adedayo (2012); Adegbehingbe (2011)
Sociocultural	Social norms/traditions	Omar et al. (2017); Maina et al. (2016); Isah (2016); Mirmoghtadaee (2009)
	Privacy	Quaffas (2011); Tanaka et al. (2003); Sibley-Behloul (2002)
Economical	Home-based enterprises (HBEs)	Adeokun & Ibem (2016); Olima & Onyango (2015); Kellett & Tipple (2000);
	Additional income	Bolaane & Kalabamu (2013); Aduwo et al. (2013); Makachia (2005)
	Investment	Quaffas (2011); Tipple et al. (2004)

Institutional	Bye-laws, policies	Carrasco, Ochiai & Okazaki, (2017); Bolaane & Kalabamu (2013); Tipple et al. (2004)
	Plot size, configuration	Aryani et al. (2017); Tipple, Masters & Garrod (2000); Reis (2003)
	Shortfall in housing supply	Aduwo et al. (2013); Makachia (2005); Tipple et al. (2004)

Spatial factors

Spatial factors refer to extensions, additions and modifications of functional spaces involving increasing the sizes or numbers of rooms. Spatial reasons also manifest in changing the functions of spaces within a house. Reasons proffered in literature for spatial transformations include changes in family needs and demographics, increase in income as well as the need for more efficient functionality.

Changes in family demographics and composition is the most frequently proffered reason in literature for transformations of housing units as illustrated in Table 1. Such changes relate to increase in the number children and inhabitants (Aduwo & Ibem, 2017; Hamid & Mohamed Elhassan, 2014), presence of extended family (Carrasco et al., 2017; Makachia, 2005; Morris et al., 1998) and marriage of either the household head or his children (Tanaka et al., 2003; Sibley-Behloul, 2002). Increase in household income and profession often present opportunities for residents to transform a dwelling in order to achieve greater comfort for the changing needs and conditions of families (Maina et al., 2016). Aryani et al. (2017) describe how extension of kitchens into backyards depends on the working status of the wife as a home-maker or a professional. Working women spend less time preparing meals, often ordering take-outs in place of home-cooked food and thus have little need for extensive space for food preparation. Mirmoghtadaee (2009) proffers similar reasons for shrinking sizes of kitchens in contemporary Iranian apartments compared to larger traditional kitchens which cater to the way of communal living within extended families. Balconies that were designed in lieu of traditional open courtyards in such apartments were converted into stores. Ageing or other mobility-impared illnesses likewise necessitate extensions or changes in function. Older residents are likely to relocate and occupy ground floor spaces due to difficulties in mobility over time (Cil, 2007).

Spatial transformations are often physical involving the subdivision or extension of rooms, conversion of service and storage spaces into verandas, porches, carports and courtyards (Aryani et al., 2017; Isah, 2016; Aduwo et al., 2013; Tanaka et al., 2003; Tipple, 1999). Spatial transformations also include adding rooms within open courtyards (Isah, 2016) as well as demolishing walls to increase sizes of spaces (Aduwo et al., 2013). Converting functions of spaces from other uses such as garages into bedrooms (Maina, 2013), dining rooms into family living areas (Aryani et al., 2017) or storage into sleeping areas constitute non-physical spatial transformations.

Structural factors

Structural factors influence transformations to structural components of dwellings such as roofs, walls or services caused by the lack of satisfaction with original plans of dwellings. Dissatisfaction with original floorplans and layouts is one of the main reasons owner-occupiers modify public housing units. The most pertinent explanation proffered is that different family situations exist among residents and one-size-fits all approach of prototype designs can in reality not fit all. Aduwo et al. (2013) noted that structural transformations occur because residents are dissatisfied with original plans of prototype houses, especially sizes of sitting rooms and bedrooms. Isah's 2012 study of intermediate prototype houses reports that rigid inflexible configurations of floorplans made modifications by owner-occupiers difficult. Except for core housing units intended for user modifications over time, prototype units especially in Nigeria are allocated as finished products with little provision incorporated for expansions in future (Muoghalu, 1984). Makachia (2005) asserts that house form, and by implication, typology greatly influences

transformations as users usually transform freestanding or semi-detached single storey houses compared to high-rise structures primarily because the latter make transformations difficult due to the high cost of structural systems required by multi-storey dwellings. Extensions in such cases are usually constructed at ground level to accommodate requisite functions that were not originally part of the dwelling. These are usually shops and salons. Generally, owner-occupiers in developing countries extend dwellings horizontally, preferably at ground level, rather than vertically (Shiferaw, 1998). This implies that architects and designers indirectly influence transformation of mass housing through the configuration of original designs. Unfortunately, such avenues are rarely considered at initial design stages (Olima & Onyango, 2015). It is also common to observe changes in building materials for structural elements of owner-occupied houses in older public housing estates. A classical example in Nigeria is changing asbestos roofing to aluminum longspan sheets due to health and maintenance problems associated with asbestos construction. Residents likewise change or extend walls in dwellings with modern more durable materials such as concrete blocks (Hamid & Mohamed Elhassan, 2014) or with temporary materials such as corrugated roofing sheets, timber or wood in order to delineate property (Makachia, 2005).

Psychological factors

Psychological factors present a wide variety of reasons compared to other factor and encompass behaviours motivated by emotions, needs, wants and human responses to environmental or external stimuli such as the need to upgrade dwelling units in order meet advances in technology, improve aesthetics especially facades, reflect status of owners and modern trends, delineate territories, personalise similar looking elevations as well as to provide security (Table 1). The need to upgrade residences in order to conform to modern trends underscores the motivation to keep up with trending styles (Maina et al. 2016; Shiferaw, 1998). Older dwelling units are particularly susceptible to this because many require routine maintenance efforts, which owners see as opportunities to reflect contemporary trends. It is common to see prototype houses finished with ceramic tiles or interiors finished in modern colours and materials such as decorative ceilings from Plaster of Paris (POP) or more recently, polyvinyl chloride (PVC) strips in the Nigerian context. Extensions to kitchens and storage areas have emerged to accommodate washing machines, hitherto uncommon within dwelling units. Nguluma (2003) reported that transformation of houses was generally associated with modernisation mainly through contemporary building materials and styles. These contributed to upgrading the environment. A rise in property values usually succeeds such transformative efforts. Improving facades is particularly emotive as this gives visitors and passers-by a positive first impression about the owners of a house. It relates closely to social status because “people want to present the best image to outsiders as far as they can economically afford it” (Maina et al., 2016, pp. 40). Few aspects of housing arguably provide personal satisfaction as meeting the psychological needs of residents. Consequently, psychological factors most influenced transformation of public housing in Kano and Dutse (ibid).

Personalisation usually addresses the similarity of facades and floor plans, a disadvantage labelled against prototype public housing schemes as uniform looking houses connote similarity in life situations. Security wise, anyone who has the knowledge of one house within a cohort of prototypes can easily navigate the layout of the other houses. The need to be different is thus a powerful motivator for residents to personalise their homes in terms of elevations and floor plans. Consequently, delineating entire plots using fences is one of the first things owner-occupiers of public housing estates embark upon in Nigeria (Adedayo, 2012). This behaviour addresses many psychological needs. First, it delineates property while defending territory. Secondly, it provides opportunities to change facades and display modern trends if the owner so wishes. Thirdly, many Nigerians believe that erecting fences adds another layer to the security of inhabitants. Recent studies in Crime Prevention Through Environmental Design (CPTED) however illustrate that fences provide opportunities to conceal and encourage crime. Adzande (2019) reports that fences were ineffective in preventing or controlling victimisation and armed robbery in residential areas within Makurdi. “The presence of fences could

contribute to reduced visibility by limiting the ability of residents to watch the streets . . . preventing passers-by from observing what is happening within the homes. Thus fences provide the concealment needed for crime to thrive" (pp. 337). This supports Mohammad, Goshi and Muhammad (2018) who illustrate that high fences, though affording privacy, restrict natural street surveillance of potential intruders. See-through but not access-free fencing is advised to mitigate this problem.

Sociocultural factors

Culture greatly influences the way we live. Housing presents one of the most powerful arenas to display cultural practices of individuals and societies. Mirmoghtadaee (2009) notes that prevailing lifestyle, embedded in sociocultural characteristics of a society, is embodied in composite elements of residential units. Consequently, social norms and traditions are strong motivators of transforming dwellings. Aryani et al. (2017) and Omar et al. (2017) reported that modifications and extensions to prototype housing were frequently carried out to incorporate wet and dry kitchen areas, a traditional sociocultural way of life in Malaysia. Similarly, cordoned outdoor open spaces immediately proximate to ground floor flats using landscaping elements and trees serve as male living and entertainment areas within public housing in Algiers largely because dwelling units contain no spaces to cater to diurnal functions delineated along gender activities (Sibley-Behloul, 2002).

Privacy, closely related to social norms is another recurring reason proffered for modifications in public mass housing schemes worldwide. Privacy is important in most families especially as children grow and gendered activities take pre-eminence. Sibley-Behloul (2002) reports that the conversion of living rooms into sleeping areas for male children within flats at night while females sleep in bedrooms preserved religious and sociocultural privacy requirements among Muslim residents in Algiers. To achieve privacy amidst enlarging families, residents of topmost storeys in Medina often added entire floors in order to accommodate more rooms (Quaffas, 2011), compromising the structural stability of many residences. Isah (2016) and Maina (2013) concluded that residents in northern Nigeria often transformed or abandoned public housing units due to the lack of sociocultural values incorporated within original prototype housing designs.

Economic factors

Economic factors are associated with increase in income or earning power of residents using their dwellings. According to Tipple (1999), residents in developing countries accomplish economically motivated goals through HBEs, renting of shops, habitable rooms or flats. Comparatively few studies report the modification of dwellings expressly for future investment through outright sale in developing countries, unlike in developed countries where flourishing housing markets support sales or mortgaging of property (Garrod Willis & Tipple, 1995).

HBEs refer to the production of and/or sale of goods or services from home. As Kellett and Tipple (2000) remark, HBEs blur the boundaries between domesticity and work, often with consequences regarding gender relations, as the home is primarily a domestic female domain. Although HBEs in low income and slum areas frequently imply active use of the same spaces for work and family life, HBEs in traditional northern Nigerian homes could encompass money-earning enterprises. These include operating small grinding machines usually on verandas or within open courtyards, selling firewood as outdoor cooking is still practiced in many Nigerian homes, hair weaving, processing traditional condiments (*dawadawa, kuka* etcetera), beauty treatments (waxing, henna body art), baking, traditional food production (*masa, kosai, samosa, pankasau, alkaki*), poultry, fishery, tailoring, barbering (*wanzami*), blacksmithing etc. This is similar to what obtains within traditional households in southwest Nigeria largely among the Yorubas (Adeokun & Ibem, 2016). The authors however concluded that HBEs within public housing estates in southwest regions differed from their traditional counterparts in the sale of retail products which were more predominant in public housing.

Within Africa and other developing countries, transformations are common as room extensions or construction of complete freestanding rooms for rent or for commercial purposes. Bolaanle and Kalabamu (2013) describe such transformations in Tlokweng, Botswana. Owing to government policies on land allocation and rapid urbanisation due to proximity to Gaborone and South Africa, owner-occupiers realised that rental housing provided very good incomes. Rental housing in the area comprises one or two-roomed detached houses erected anywhere within compounds with entrances independent of owner access to preserve privacy for families of landlords. The study revealed that Tlokweng communities developed compounds expressly for rental purposes. Tipple et al. (2004) similarly reported that rental income motivates transformations of owner-occupied public housing in Zimbabwe, unlike in Ghana where the need for accommodating growing families primarily motivated extensions. Evidence in literature supports the notion that the primary motivations for transformation of dwellings in developing countries are needs associated with growth of families and personal consumption of housing as a product (Tipple et al., 2004; Garrod et al., 2000). Economic factors are often secondary depending on circumstances and location, unlike in many developed countries where improvements are simultaneous with return on investment (Tipple et al., 2000).

Institutional factors

Institutional factors influencing transformations of dwellings relate to government policies, bye-laws, plot size and configuration as well as shortfall in housing supply. They are arguably the least reported within prototype public housing transformation literature in Nigeria. Government policies, programmes and bye-laws involving public schemes, land and housing allocation all influence transformation. As reported in foregoing paragraphs, changes to ownership and allocation of land, establishment of tertiary institutions and proximity to large urban cities facilitated a thriving rental market in Tlokweng, Botswana. Tipple et al. (2004) also note that policies regarding design and plot sizes explain differences in motivation and type of transformation in Ghana and Zimbabwe. Original typologies in Ghana comprise single rooms alongside verandas with narrow footages insufficient to accommodate nuclear families. Conversely, original prototype units in Zimbabwe were mainly semi-detached and detached bungalows with three habitable rooms set in large demarcated plots. Transformations thus targeted rental accommodation to supplement family income. Carrasco et al. (2017) reported that restrictions by Non-Governmental Organisation (NGO) policies largely influenced modifications in disaster-induced resettlement sites in the Philippines as only kitchen enclosures and lofts received transformative efforts.

Plot configuration and size accruing from urban planning policies also influence transformations. Aryani et al. (2017) revealed that narrow plot widths limited modifications of terrace housing in Malaysia, forcing extensions to backyards with adverse effects on natural ventilation and daylighting. Similarly, Reis (2003) established that configurations which evolved from transformed houses were limited by original plot sizes and that transformation did not always translate to higher satisfaction levels. This presents one of the few studies that links satisfaction to transformative efforts of residents.

In sum, the literature review reveals that:

i). Sociocultural, psychological and economic factors find expression largely through spatial and structural transformations in the context of public housing especially in developing countries.

ii). Economic reasons are common within traditional households in both southern and northern regions of Nigeria. HBEs have however been largely reported to influence public housing transformation within southwest Nigeria. Comparatively little similar investigations have been conducted in northern regions.

iii). Institutional factors are arguably the least reported in the Nigerian public housing transformation literature to inform housing and urban policy.

iv). Satisfaction of residents within transformed public houses is likewise seldomly analysed. This is important because residential satisfaction is a measure of housing

adequacy and an important indicator of housing quality (Ibem & Alagbe, 2015).

Consequently, the study aims at investigating factors that most influence transformation within prototype public housing in northern Nigeria and how these relate to residential satisfaction.

3. Methodology

Study area

The study adopted a mixed methodology in three stages. A random selection of one State within each of the three geopolitical zones in northern Nigeria constituted the first stage. Sokoto was selected in the northwest, Abuja the Federal Capital Territory (FCT) in the northcentral and Yobe in the northeast region of the country. Selection of owner-occupied public housing estates in each State and the FCT constituted the second stage. The criterion for selection was that estates were constructed after the last round of State creations in 1996. This ensured similarity in typology, building materials and tenancy across the sample. The third stage involved establishing the population of the study in each estate through physical observations of transformed houses. These formed the target sample for the distribution of survey questionnaires.

The housing estate in Sokoto consisted of 200 blocks of semi-detached 2-bedroom units and 100 blocks of 3-bedroom freestanding bungalows. In Abuja, 30 blocks of 2-bedroom semi-detached units served as the population. 30 dwelling units had been transformed within each of the two estates at the time of the study. In Yobe State, 35 transformed units formed the study sample out of 50 houses located in Potiskum. This produced a sample size of 95 housing units across the three estates. Dwellings in all three estates were single-storey detached and semi-detached bungalows, constructed of concrete masonry blocks and roofed with aluminum sheets. Access into all the houses were through verandas at the front and open courtyards at the back.

Survey instrument and data analyses

A survey was conducted between June and August 2019 to address the aim of the study. The survey questionnaire, adapted from Ilesanmi et al. (2015) was designed in three sections. Section one requested data on socioeconomic variables specifically gender, marital status, age, education, income, length of stay, household size, religion, number of wives, tribe and number of bedrooms. Presented as frequencies and percentages, results from this section describe respondent profiles. Section two requested respondents, who were household heads, to rate 20 reasons residents transform their dwellings on 5-point likert scales with 5 denoting strong agreement and 1 strong disagreement. Two sets of analyses were conducted on the list of reasons residents transform their dwellings presented in Table 3. First, descriptive statistics employing means (M), standard deviations (SD) and rankings based on means provide an overview of average ratings of reasons for transformation. Means equal to or above the mid-point value of 3.0 on a 5-point likert scale are considered important in this study. Computed at 0.868, reliability for the 20 items was higher than the recommended minimum of 0.70 (Field, 2013). Secondly, responses were subjected to Principal Component Analyses (Varimax rotation with Kaiser normalisation) to explore factors influencing transformation from user perspectives. Factor loading was set at a minimum 0.40 and eigenvalues above 1.0 were extracted (Field, 2013). Kaiser-Meyer-Oikin measure was 0.754 while Bartlett's Test for Sphericity was significant at *p=0.000*, confirming adequacy of sampling. The last section requested residents to rate their satisfaction with 13 features of dwelling units. These were analysed using descriptive statistics (Means, SD and ranks based on mean values) in Table 5. In addition, Relative Satisfaction Index (RSI) was computed as a ratio of the sum of actual satisfaction scores (SS_{ac}) and maximum possible satisfaction score (PSS_{max}) on a 5-point likert scale from 1, very dissatisfied to 5, very satisfied VS (Equation 1).

$$RSI = \frac{SSac}{PSSmax} \quad \text{.....(1)}$$

PSS_{max} was computed as the product of the number of responses (*n* in Table 5) and maximum possible rating of 5. Items with RSI above 0.60 were considered adequate

in this study. Results from these analyses are presented in succeeding sections.

4. Results and Discussion

Results

Out of the 95 questionnaires distributed, 73 (77%) were returned and employed for analyses. Results presented in Table 2 illustrate that on average, respondents were male (67%), married (78%) and aged between 41-50 years. Bachelor and Master degree holders account for about 70% of the sample while the civil service employs over two-thirds (67%) of respondents. Approximately two-thirds of the sample (66%) earn incomes well above the minimum wage limit, placing majority of respondents within the mid to high income bracket. More than one-third (38%) of respondents have lived within the estates for over 10 years. According to Aduwo et al. (2013), this is considered the average period for transformations within public housing estates to commence. Tenure status is heavily skewed in favor of owner-occupiers (81%) compared to residents who are renters (15%) or who were allocated the houses as official quarters (4%). Large households accommodating six or more people dominate the sample (65%), with 74% of respondents being Muslims. Number of wives as a variable recorded the highest missing data in Table 2, although households with a single wife dominated the responses received (41%). As expected, Hausa respondents accounted for about half the sample (49%) with 81% of the surveyed houses containing 2 and 3 bedrooms. This demographic profile fits the expected profile of transformers within public housing (Aduwo et al., 2017) and in northern Nigeria (Maina et al., 2016), with the exception of two variables-number of wives and number of bedrooms.

Although a high proportion (44%) for the number of wives across the sample came from the no response categogy, the observation that 41% of household heads are married to one wife in northern Nigeria deviates from the norm as the Islamic faith allows men to marry up to four wives concurrently. This has been a reason proffered for transformation of public housing in a previous study conducted in northwest Nigeria (Maina et al., 2016). However, approximately 70% of respondents hold tertiary degrees. This may have influenced the result as advanced educational qualifications often modulate sociocultural and religious practices as well as beliefs. The second anomaly concerns the relatively small number (16%) of dwellings with more than three bedrooms. This result suggests that a low prevalence of adding bedrooms to houses exists across the sample. Aduwo et al. (2017) present a contrasting report in Lagos, southwest Nigeria where adding bedrooms recorded the highest frequency of transformations within public housing estates. In addition, while previous studies (Aduwo & Ibem, 2017; Aduwo et al. 2013) in southwest Nigeria reported a high proportion of residents within public housing as being employed within the private sector (71%) and earning low (38%) to lower middle-incomes (31%), results from the current study reveals otherwise. Residents in the current sample are largely civil servants within the mid to high income group.

Table 2: Demographic profile of respondents

Variable	***Category***	***Frequency (n 73)***	***%***
Gender	Male	49	67%
	Female	13	18%
	No response	11	15%
Marital Status	Married	57	78%
	Single	10	14%

Variable	***Category***	***Frequency (n 73)***	***%***
	No response	6	8%
Age in years	18-24	2	3%
	25-30	8	11%
	31-40	16	22%
	41-50	31	42%
	51-60	15	21%
	60+	1	1%
Education	O Levels	13	18%
	Diploma	7	10%
	BSc	38	52%
	MSc	13	18%
	No response	2	3%
Employment	Civil Service	49	67%
	Private organisations	9	12%
	Self employed	11	15%
	Retiree	2	3%
	No response	2	3%
Monthly Income	<18,000	10	14%
	18-37,000	7	10%
	38-50,000	6	8%
	51-100,000	15	21%
	101-150,000	10	14%
	150,000+	17	23%
	No response	8	10%
Length of stay in years	<1	9	12%
	1-3	7	10%
	4-5	12	16%
	6-10	15	21%
	11-15	7	10%
	15+	21	29%
	No response	2	3%
Tenure	Owner-occupied	59	81%
	Official quarters	3	4%

Variable	*Category*	*Frequency (n 73)*	*%*
	Rented	11	15%
Household size	1	1	1%
	2	2	3%
	3	4	5%
	4	10	14%
	5	7	10%
	6	15	21%
	6+	32	44%
	No response	2	3%
Religion	Islam	54	74%
	Christianity	10	14%
	Traditionalist	1	1%
	No response	8	11%
Number of wives	1	30	41%
	2	8	11%
	3	3	4%
	No response	32	44%
Tribe	Hausa	36	49%
	Igbo	5	7%
	Yoruba	7	10%
	Others	23	32%
	No response	2	3%
Number of bedrooms	2	30	41%
	3	29	40%
	3+	12	16%
	No response	2	3%

Results from descriptive statistics in Table 3 reveal two trends. First, residents rated all reasons as important with the exception of converting houses for commercial purposes. In fact, the least ranked reasons are economic, suggesting that residents are unlikely to engage in HBEs or commercial activities within individual dwellings. Secondly, SD for all variables were high (above 1.0), indicating variations in responses across the sample. This observation suggests that quantitative approaches maybe inadequate in capturing respondents' subjective assessments regarding reasons for public housing transformations. Similar studies in future are likely to benefit from qualitative methods such as interviews or participant observations. Housing provision for low-income earners was the only exception with SD slightly less than 1 (0.987), supporting assertions that public housing programmes within the region rarely address of low-income groups. Results in Table 1 affirm that public

housing units in northern Nigeria are generally allocated to civil servants who usually do not fall within the low-income bracket. Results on Table 2 support the widely practiced owner-occupier monetisation policy practiced in many States. These are often employed as campaign strategies as allocating public housing units to civil servants ensures political support in the form of votes from the public sector, which arguably employs the most influential individuals at State levels, in favor of incumbent governments. In addition, large public housing estates present enduring legacies alongside the provision of other physical and capital-intensive projects such as roads, electricity and water supply necessary to support such projects. This observation implies that public housing in northern Nigeria in reality does not target low-income earners as advocated within the National Housing Policy (FGN, 2012). Allocating housing units to mid-high-income earners also provides another reason why economic activities are the least ranked across the sample. This socioeconomic bracket encompasses civil servants who have on average, acquired a minimum Bachelor degree. This cohort is likely to have imbibed the British aristocratic aversion to trading, ascribed to the lower class in society. HBEs may be viewed as incompatible with a way of life associated with educated bureaucrats.

Results in Table 3 also illustrate the need for more interior spaces due to increase in family size, supporting findings presented in Table 1 that changes in family needs and composition are the most proffered reasons for transformation of dwelling units from literature. Recall that large families dominate the sample in Table 2. This provides further justification why transformations due to increase in family size was ranked first.

Table 3: Descriptive statistics of reasons for transformations

Reason for transformation	***Mean***	***SD***	***Rank***
Need for more interior spaces due to increase in family size	3.85	1.186	1
Transformation is inevitable and unavoidable	3.78	1.031	2
Upgrade to a more modern house	3.70	1.050	3
Housing needs of public housing residents are not satisfied	3.66	1.083	4
Transformed house better suits my family needs	3.58	1.189	5
Low-income sector not adequately catered for in housing provision	3.53	0.987	6
I can adjust my housing need at my own pace and cost	3.52	1.082	7
Need for territoriality and privacy	3.47	1.191	8
Dissatisfaction with quality of finishes and building materials	3.45	1.119	9
Transformation adds variety to uniformity of public housing	3.45	1.155	9
To improve aesthetics and beauty of the house	3.36	1.368	11
Dissatisfaction with service spaces (toilets, bathroom, kitchen)	3.33	1.179	12
Lack of maintenance in public housing	3.29	1.230	13
Dissatisfaction with bedrooms and sleeping areas	3.19	1.114	14
Dissatisfaction with original house plan	3.16	1.247	15
Dissatisfaction with living areas (sitting rooms, veranda, dining)	3.15	1.175	16
Transformation provides pride and adds to my social status	3.12	1.190	17
Shortfall in housing supply	3.07	1.097	18

Allows for HBEs/renting rooms	3.00	1.225	19
Converting part of the house for commercial purposes	2.58	1.129	20

Table 4: Principal Component Analysis of reasons for transformation

Variable	***Factor loading***	***Eigen value***	***% Variance***	***% Cumulative***
#1 Dissatisfaction with dwelling design		*3.355*	*16.78*	*16.78*
Dissatisfaction with living areas (sitting rooms, veranda, dining)	0.798			
Dissatisfaction with quality of finishes and building materials	0.778			
Dissatisfaction with original house plan	0.719			
To improve aesthetics and beauty of the house	0.632			
#2 Individuality, inadequacy in Public Housing		*3.156*	*15.78*	*32.56*
Transformation is inevitable and unavoidable	0.759			
Transformation adds variety to uniformity of public housing	0.750			
I can adjust my housing need at my own pace and cost	0.649			
Upgrade to a more modern house	0.582			
Low-income sector not adequately catered for in housing provision	0.547			
Transformation provides pride and adds to my social status	0.401			
#3 Increasing housing stock, maintenance, privacy and services		*2.165*	*10.83*	*43.39*
Shortfall in housing supply	0.864			
Lack of maintenance in public housing	0.612			
Need for territoriality and privacy	0.482			
Dissatisfaction with service spaces (Toilet/Bathroom, Kitchen)	0.457			
#4 HBEs/incorporating user needs		*1.923*	*9.62*	*53*
Allows for home-based enterprises/renting rooms	0.878			
Housing needs of public housing residents are not satisfied	0.653			
#5 Increasing interior/sleeping spaces		*1.855*	*9.27*	*62.28*
Need for more interior spaces due to increase in family size	0.816			
Dissatisfaction with bedrooms and sleeping areas	0.635			
Transformed house better suits my family needs	0.617			
#6 Economic needs		*1.368*	*6.84*	*69.12*
Converting part of the house for commercial purposes	0.838			

Results from the PCA in Table 4 illustrates that six components emerged from reasons residents transform their dwellings. These account for approximately 70% of the variance. The first, lack of satisfaction with dwelling design, accounts for 16.78% of the total variance. This component includes dissatisfaction with main functional areas, original design, finishes, building materials and the need to improve aesthetics and beauty of houses. Component two addresses the need for individuality and inadequacy of public housing for low-income earners and accounts for 15.78% of the total variance in Table 4. The third component captures increasing housing stock, maintenance, privacy and services while the fourth addresses HBEs and housing needs of residents. Component five addresses the need for increasing interior and sleeping spaces. This component targets spatial inadequacies within the dwelling units. Converting the house for commercial purposes records the lowest eigenvalue, affirming results in Table 3 that economic factors are the least important reasons for transformation from the present sample. These also support results proffered by Ilesanmi et al. (2015) where economic factors recorded the lowest eigenvalue. The observation however deviates from reports by Aduwo et al. (2013), Tipple et al. (2000) and Shiferaw (1998) where economic reasons strongly influenced transformations in public housing.

Results in Table 5 present satisfaction ratings of dwelling unit features which on average was 2.99, implying dissatisfaction across the sample. The first eight features were rated as being inadequate by residents and reflect spaces causing dissatisfaction in Table 4. Ratings for sizes of cooking and storage spaces, water and electricity supply, toilet and bathrooms, sizes of living and dining spaces, number of bedrooms, type of building materials and external appearance of houses all recorded higher frequencies in the very dissatisfied and dissatisfied columns as well as mean values below 3.0 and RSI equal to or less than 0.60. These statistics support results from the PCA as well as the observation that dissatisfaction with dwelling unit features is related to and fosters transformations.

Table 5: Satisfaction of dwelling unit features

Dwelling unit features	*Frequencies*						***n***	***SS_{ac}***	***Mean***	***SD***	***RSI***	***Rank***
	VD	***D***	***N***	***S***	***VS***	***No response***						
Sizes of cooking/storage areas	14	16	23	14	4	2	71	191	2.69	1.166	0.54	1
Water supply sanitary service	13	21	19	8	10	2	71	194	2.73	1.287	0.55	2
Electricity supply and service	9	19	24	16	2	3	70	193	2.76	1.042	0.55	2
Bath/Toilet facilities	9	20	22	13	7	2	71	202	2.85	1.167	0.57	4
Sizes of living/dining spaces	12	14	24	15	7	1	72	207	2.87	1.210	0.58	5
Number of bedrooms	5	26	20	13	7	2	71	204	2.87	1.108	0.57	6
Type of building materials	10	14	22	21	4	2	71	208	2.93	1.138	0.59	7
External appearance of your house	3	18	28	17	3	4	69	206	2.99	0.931	0.60	8
Type of house	3	17	29	16	5	3	70	213	3.04	0.970	0.61	9
Noise levels in house and estate	6	16	22	14	12	3	70	220	3.14	1.207	0.63	10
Level of privacy in your house	7	11	23	17	12	3	70	226	3.23	1.206	0.65	11
Sizes of bedrooms	3	10	24	27	7	2	71	238	3.35	0.987	0.67	12
Natural lighting and ventilation	4	9	20	25	11	4	69	237	3.43	1.091	0.69	13

VD=Very Dissatisfied (1); D=Dissatisfied (2); N=Neutral (3); S=Satisfied (4); VS=Very Satisfied (5)

Discussion

Findings from this study illustrate that apart from the already well established spatial and structural factors, psychological and institutional factors also influence transformations in the study area. Psychological factors are expressed in the lack of satisfaction with designs of housing units and the need for individualisation within them. These account for nearly half the total variance for reasons residents transform dwelling units. These reflect the need for personalisation largely influenced by allocating houses to a cohort of residents, in this case, civil servants as a result of institutional policy. This result supports the observation by Ukoha and Beamish (1997) that dissatisfaction with dwelling unit design was a major cause of residential dissatisfaction among residents of public housing estates in Abuja who were largely civil servants. In addition, planners fail to consider the effect of time on changing expectations of residents owing to family life changes and upward movement on the socioeconomic ladder (Muoghalu, 1984). This conflict inevitably translates to dissatisfaction as dwelling units are not flexible enough to accommodate changes by residents. Findings from this study regarding design of spaces, finishes and building materials, inevitability of transformations as well as personalisation of dwellings also underscore the need for flexibility in initial designs as well as user input in public housing (Isah, 2016; Muoghalu, 1984).

The finding on spatial and psychological factors influencing transformations in the study area also supports reports by Maina et al. (2016) in Kano and Dutse, Northwest Nigeria. Transformations frequently involved improving the quality of living spaces accessible to guests through tiling and painting of walls as well as ceilings, fencing of property, provision of external toilets and bath to supplement those in original designs as well as modification of facades to reflect modern trends. This confirms that a major source of dissatisfaction among residents of owner-occupied public housing estates in northern parts of Nigeria are due to inadequacies in the design of major living spaces as well as the quality of building materials and finishes employed in constructing the houses. This requires a rethink into design, specifications and contract processes employed for the procurement of public housing in the region. Endemic corrupt practices within the Nigerian Public Procurement process are well-documented phenomena (Aduwo et al. 2020). This ultimately affects the quality of procured items and materials employed in construction, housing inclusive. Contractors are known to cut back on the quality (and sometimes quantity) of construction materials and gross floor areas of buildings just to break even for contracts awarded. Consequently, poorly constructed public housing estates are allocated to residents who are then compelled to make necessary transformations to achieve the desired quality. Such transformation sometimes involves the complete demolition and reconstruction of owner-occupied public housing units (Maina & Aliyu, 2022).

Economic reasons exerted the least influence on transformation of public dwelling units. This supports recent findings in other parts of northern Nigeria (ibid). This finding however contrasts with findings proffered by Adeokun and Ibem (2016) where HBEs were a major reason for the transformation of public and private housing units. The study concluded that the practice of HBEs within the housing units had antecedents from the traditional way of life in southwest Nigeria where trading at home is common especially among women who formed a sizeable proportion of the respondents, unlike the current study. Interestingly classified alongside housing needs in factor five, HBEs are separate from conversion of part

of the house for commercial purposes from user responses. A plausible explanation for this observation is that respondents who are mostly male household heads (Table 1) view HBEs separate from classic economic activities in the study area. Females largely run HBEs and proceeds likely remain personal and not necessarily pooled into family expenses within dominant Muslim households in many parts of northern Nigeria where male household heads are responsible for the upkeep of their families. Additionally, given the medium to high-income earnings and high educational qualification of respondents, wives may already be professionals or economically comfortable and need not engage in HBEs. Notwithstanding these observations, the fact that HBEs are classified alongside housing needs of residents implies the need to separate projections for HBEs within dwellings in northern Nigeria. This observation also calls for a deeper understanding of reasons why residents in the study area view HBEs separate from economic activities as this finding contradicts popularly held beliefs in literature (Kellett & Tipple, 2000).

5. Conclusion and Recommendations

This study explored factors influencing transformation of public housing units in northern Nigeria. Four main findings accrue from the study results. First, residents of public dwellings surveyed were mostly middle to high-income earners. Few belong to the low-income group, implying that end-users of many public housing estates are not low-income earners. Secondly, spatial, structural, psychological and institutional factors most influence transformations, specifically dissatisfaction with design and finishes to dwellings as well as personalisation related needs. The latter was a function of allocating prototype public housing units to a similar cohort of civil servants in the surveyed estates based on institutional policies of allocating public housing based on owner-occupier basis at State levels. Thirdly, economic factors least influence transformations, implying that transformations primarily cater to family requirements and personal needs of residents and not necessarily for economic reasons. Lastly, dissatisfaction with housing features reflected the reasons why residents embarked on transformations.

Recommendations target design professionals and policy makers in the region. Design professionals need to note that flexibility is critical in future designs as dissatisfaction with design aspects of dwellings were the strongest influencing factors for transformations. Practically, this implies architects and allied construction professionals need to project possible transformation trends alongside meeting current design requirements within public housing. Such processes require in-depth research into transformation trends within formal and informal environments, presenting areas for future research. Additionally, policies need to embrace the inevitability of transformations in public housing estates in Nigeria as transformations imply changes in the built environment with attendant pressure in existing infrastructure especially water and electricity supply, provision of roads, drainages and waste disposal. Active discussions at grassroot and community levels for incorporating local techniques and modalities are long overdue. These should also address housing issues of low-income groups if government is to meet agreed targets for Sustainable Development Goals, particularly item 11 regarding Sustainable Cities and Communities by 2030. In addition, dissatisfaction with building materials and finishes illustrate design specification inadequacies and the use of low-quality finishes in the study area. Housing allocation policies also influence transformations within uniform prototype units.

Importantly, results from the study imply that while transformations occur to cater to family needs within dwellings, economic activities to support increasing populations within estates are likely to occur outside of individual dwellings, usually within communally shared spaces and along streets. This supports observations made during the survey where shops were attached to street-facing facades of fences to individual houses. While residents of public housing in northern Nigeria do not generally engage in HBEs, they are more likely to generate income by building shops and leasing them out. A design and planning consequence of this observation is that more economically related spaces will be required outside of individual dwelling units. Streets and roadsides, as well as empty undeveloped open spaces within public housing estates are likely to attract economic formal and most often, informal activities over time. This will further create traffic congestions while burdening existing service infrastructure such as drainage, refuse and waste disposal, water and electric supply as well as internet connectivity than originally planned for. Establishing the mechanisms and characteristics of these changes in order to inform policy and urban management in future towards minimizing their negative cumulative effect is beyond the scope of this study. It however presents interesting avenues for future research.

Another limitation of this study was the use of pre-determined statements, which may have limited the range of reasons for transformation within public housing. Future investigations into transformations and related phenomena such as HBEs would benefit from qualitative approaches such as participant observations and interviews. Though more expensive and tasking (Kellett & Tipple, 2000), such approaches are likely to unearth more detailed explanations and trends from residents and the environments within which transformations occur. Urban policy will also benefit from similar studies within private houses as these constitute the bulk of the housing supply in many developing countries, Nigeria inclusive.

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