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IMPACT OF TENEMENT HOUSING QUALITY ON SOCIAL RELATIONSHIP OF OCCUPANTS IN MINNA, NIGER STATE NIGERIA

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ABSTRACT

Tenement housing in most parts of the country has been both a crime and violence breeding ground in Nigeria leading to the increase in violence which has contributed to the already alarming rate of insecurity in Nigeria. Conflicts are a natural part of human interaction and it is common amongst occupiers of land and buildings which create concern to many individuals. They occur amongst the occupiers of tenement houses in Minna. This study examines the quality and social relationship impact among tenants of tenement houses in Minna, Niger State with the view to suggesting ways of attaining peaceable enjoyment and improving co-tenant relationship. The study used a cross-sectional survey, questionnaire was administered to selected tenements houses in Minna. The response from the questionnaire was subjected to descriptive statistics; frequency distribution table with percentages and Likert scale was used. The findings show that the overall Tenants' Satisfaction Index (TSI) with the building characteristics is 3.55 (fairly satisfied), Tenant's overall satisfaction index for the building quality was 3.45 (fairly satisfied) and overall Tenants' Satisfaction Index (TSI) with the neighborhood characteristics indicated that tenants in the study area were fairly satisfied (3.21). It also discovered that most common causes of conflicts amongst residents of the face-me-I-face-you type of tenements residential houses in Minna is inadequate infrastructure. It therefore recommends that adequate policy formulation to guide and bring about sustainable rental housing provision as an alternative to home ownership in the study area and in Nigeria at large.

Key words: Tenement, Housing Quality and Social Relationship

1.1 INTRODUCTION

Housing is a composite commodity that fulfils several human needs. The major need is dwelling (Bajari *et al.,* 2015) but it can also argue that having a social space to interact and socialize with family and friends, or to be able to reach a desired social status, might be some reasons for which individuals demand some housing services. Thus, from a social point of view, housing is more than a dwelling unit and its objective characteristics, since it also provides security, privacy, neighbourhood and social relations, status, community facilities and services, access to jobs and control over the environment. The complexity of the concept entails that being ''ill-housed'', could mean deprivation along any of these dimensions. It is also often an expression of personal identity

and social status. Housing is therefore an important aspect of individual well-being and quality of life.

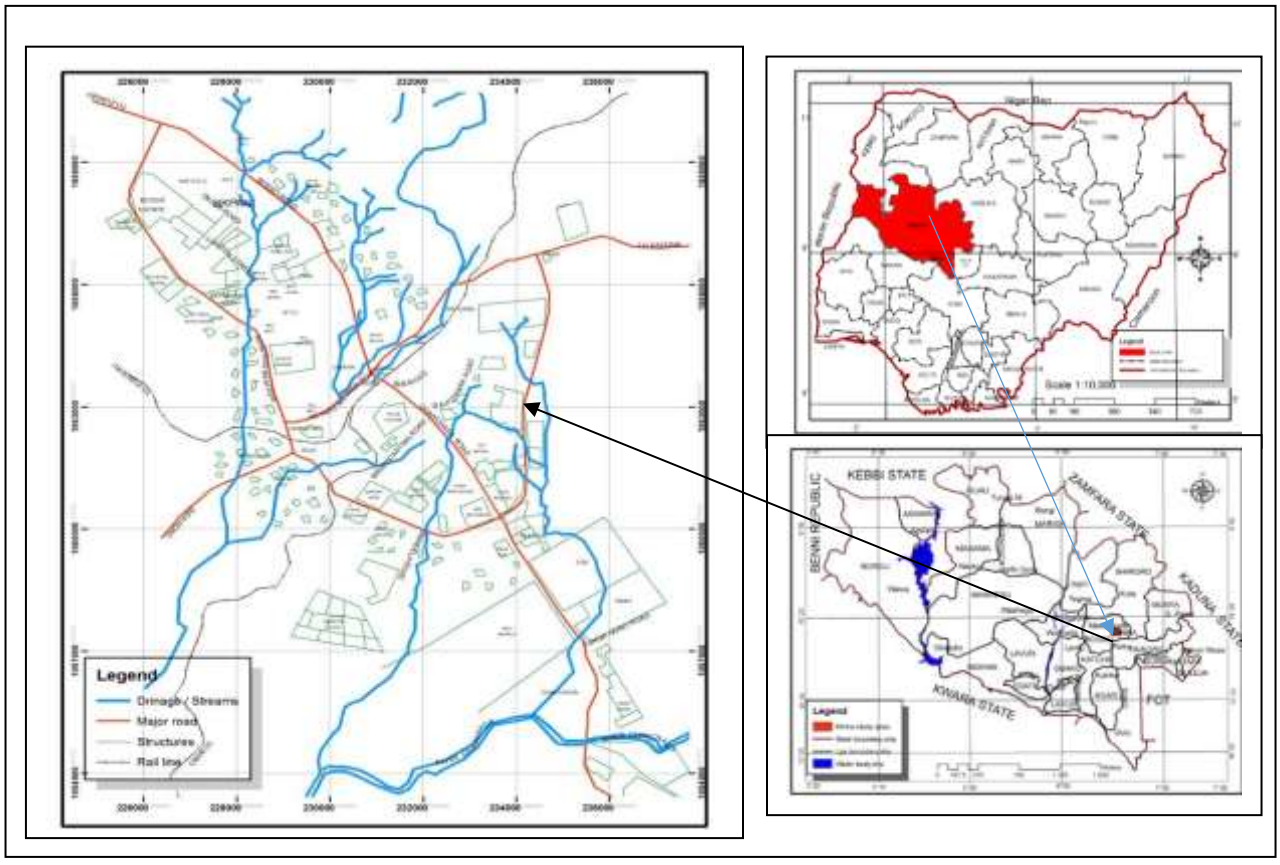
Social relations are a fundamental aspect of human life (Ajrouch *et al.,* 2017). This has been advocated early in the history of social science by luminaries and continues to be of significance today as scholars document this point both theoretically and empirically (Ajrouch *et al.,* 2017). The quality of a social relationship represents the history of past social interactions between two individuals, from which the nature and outcome of future interactions can be predicted. Impact of social relations are significant in adolescence, because comparisons and processes of identity formation are intense during this period. Moreover, children's living conditions are to a large extent dependent on and determined by relationships to other people and by others' actions and resources (Jonsson, 2010). The focus on social relations enables a view of children as actors who form relations, use social support, and make social comparisons. The active role of children and the focus on their social relations are in line with the research paradigm called *the new sociology of childhood*. Studies of children and their lives have changed during the last decades. The traditional views of children in sociology as a target of socialization, and childhood in psychology as a mere developmental stage, have been criticized (Corsaro, 2015).

The menace of poor housing in Nigeria as a result of population explosion which has resulted to the erection of tenement buildings has a major problem and has regrettably led to various social vices and more regrettably to domestic conflict. Tenement housing in most parts of the country has been both a crime and violence breeding ground in Nigeria leading to the increase in violence which has contributed to the already alarming rate of insecurity in Nigeria. Conflicts are a natural part of human interaction and it is common amongst occupiers of land and buildings which create concern to many individuals. They occur amongst the occupiers of tenement houses in Minna. The city represents the melting-point of various races, and of economic activities, commercial entities, high grade residential precincts. This makes demand for residential properties increase on daily basis as migration of all classes of people into the State increases. There are challenges posed by this factor as it affects the relationship between the tenants for various reasons ranging from non-communication to unsatisfied attitude. Most tenants especially ignore their obligation to pay utility bills and other bills binding on them by virtue of occupying the property. All these have played a huge role in affecting the relationship between them. This paper examines the housing

quality and social relationship impact among tenants of tenement houses in Minna, Niger State with the view to suggesting ways of attaining peaceful co-habitation and improving co-tenant relationship.

1.2 **Study Area**

Minna, the capital of Niger State lies between Latitude 9° 33¹ and 9° 40¹ North, and Longitude 6° 29¹ and 6° 35¹ East. At the North –east corridor of the town lies continuous steep outcrop of granite, which form a limitation towards physical development in that axis. In the present political zoning system, the town is within the North Central Zone, and occupies an area of about 884 hectares. It is about 145 kilometers by road from Abuja, the Federal Capital of Nigeria. Since 1999, the city has experienced change in both pace of growth and types of space occupied for development. It has a total area of 74,344 km^2, (Sanusi 2011). Minna has estimated projected population of 304,458 (NPC. 2016 Project to 2019) as one of the 25 Local Government Areas in Niger State, see figure 1.1.



LITERATURE REVIEW

2.1 Tenement Houses

The Oxford English Dictionary's primary definition of tenement is "a room or a set of rooms forming a separate residence within a house or block of apartments." It's a fairly all-inclusive definition that speaks to the historic definitions of tenement as well as its modern and colloquial connotations, which the dictionary also addresses with this: "a house divided into and rented out as separate residences, especially one that is run-down and overcrowded (*Mauch, 2018).* Tenement housing today constitutes a significant proportion of the housing stock in many countries, including some of the world's most developed societies. About half of the urban population in developing countries is made up of tenants (UN-HABITAT 2013). Despite that considerable progress has been achieved in developing countries in the past two decades where there has been a shift in public sector's role from direct provision of rental housing to focusing on utilization of potential and capacity of informal sector, there continue to exist a wide gap between policy formulation and its implementation particularly on rental accommodation.

2.2 Social Relationship

Social relationship is any relationship between two or more individuals. Social relations derived from individual agency form the basis of social structure and the basic object for analysis by social scientists. Fundamental inquiries into the nature of social relations feature in the work of sociologists such as Max Weber in his theory of social action. Social relationships are a special case of social relations that can exist without any communication taking place between the actors involved. Social relationships refer to the connections that exist between people who have recurring interactions that are perceived by the participants to have personal meaning. This definition includes relationships between family members, friends, neighbors, co-workers, and other associates but excludes social contacts and interactions that are fleeting, incidental, or perceived to have limited significance.

2.3 Quality of tenants' relationships

Tenants' relationships can recall both quantitative and qualitative dimensions. For instance, asking about having or not having tenants' ties is often related to the count of the number of tenants;

similarly, evaluating the degree of mutual concern and interest calls for a quantitative measure, such as the duration of tenants' or the frequency of interaction. Distinguishing between tenants' "really true" or "not true" friends (Boman *et al.,* 2012) is qualitative measures of tenants' relationships. The qualitative aspects are determined by the fact that friendship relations might be close, intense, and supportive at different levels. In general, the closer the friendship, the more evident the various qualitative attributes of friendship (Demir and Özdemir 2010).

2.3.1 Tenement Housing satisfaction and social interactions

Tenement housing satisfaction is a complex cognitive construct, and several attempts have been made to conceptualize it from disciplines other than Economics (Sociology, Psychology, Planning, or Geography). Overall, it is worth noting that theories of housing satisfaction all centre around the notion that housing satisfaction measures the difference between households' actual and desired (or aspired-to) housing and neighbourhood situations (Galster 1987; Galster and Hesser 1981; Lu 1999). Therefore, individuals make judgements about residential conditions based on their needs and aspirations. Satisfaction with one's residential situation indicates the absence of complaints and a high degree of agreement between actual and desired situations. On the other hand, incongruence between their actual housing and needed conditions may lead to dissatisfaction.

2.4 Theories of Tennent Satisfaction

Rossi (1955) introduced the notion of housing needs to conceptualize residential satisfaction / dissatisfaction. In his theory, Rossi posited that changing housing needs and aspirations as households'progress through different life cycle stages often place households out of conformity with their housing and neighbourhood situations. The lack of fit between their current and desired housing needs creates stress or dissatisfaction with their current residence. Households respond to such stress or dissatisfaction through migration, which brings a family's housing into adjustment with its housing needs. Life cycle changes may generate different space requirements, which are considered the most important aspect of the needs. Thus, households are likely to feel dissatisfied if their housing and neighbourhood do not meet their residential needs and aspirations.

Morris and Winter (1978) introduced the notion of housing deficit to conceptualize residential satisfaction / dissatisfaction. In their housing adjustment model of residential mobility, they

theorize that individuals judge their housing conditions according to normatively defined norms, including both cultural norms, which are dictated by societal standards or rules for life conditions, and family/personal norms, which amount to households'own standards for housing. Thus, an incongruity between the actual housing situation and the cultural and /or familial housing norms results in a housing deficit, which in turn gives rise to residential dissatisfaction. Households with a housing deficit who are hence dissatisfied are likely to consider some form of housing adjustment. They may attempt to make in situ adjustments to reduce dissatisfaction by revising their needs and aspirations to reconcile the incongruity or by improving their housing conditions through remodelling. They may also move to another place and bring their housing into conformity with their needs.

3.0 RESEARCH METHOD

There are two types of data used for this study, primary data and secondary data. Primary data for this study were obtained by administering prepared questionnaires. Information aimed at retorting the aim and objectives of the study were raised. Secondary data were collected from journal and previous researches related to the study and were duly acknowledge. Sources of secondary data used in this study include journals, textbooks, publications, government publications of related literature to the study. To give meaning to data, it has to be analyzed and interpreted statistically. The study employs the use of descriptive and inferential statistics. For the descriptive statistics; frequency distribution table with percentages, Likert scaling was used. The inferential statistics used is multi regression analysis to examine the housing quality and its impacts on social relationship among the occupants in Minna. The evaluation of relationship between dependent and independent variables was carried out using the multiple regression models. The first step consists of defining the variables of interest. This determines the relationship between the combined explanatory variables.

4.1 Results

4.2 Environmental and physical condition

Environmental and physical condition of the houses was examine based on provision of services available within the houses, services examined are Road to the houses, Drainage conditions around the houses, Pedestrian Lane, Water supply, Sewer system, solid waste management and

natural environment and vegetation. Table 4.2 shows the mean and standard deviation of the scores of the respondents regarding environmental and physical condition of the estates.

Table 4.1 Environmental and physical condition of the tenement's houses

Services	Mean	Std. Deviation
Road	2.0240	.74557
Drainage	1.8640	.71102
Pedestrian lane	1.7760	.83148
Water supply	1.9200	.88536
Sewer system	2.1280	.78263
Solid waste management	2.4640	1.00438
Natural environment and vegetation	2.0800	1.04419

Source: Author (2021)

The analysis shows the response of the condition of available services around the selected houses either very good, good, bad and very bad. It was discovered that drainage and pedestrian lane has a close mean score of 1.8640 (.71102) and 1.7760 (.83148) which signifies that provision of drainage and pedestrian lane around the selected houses were very good. It was also revealing that water supply has a mean score of 1.9200 (.88536) which signifies that water supply in the selected houses is good. Road, sewer system, solid waste management and natural environment and vegetation scores above 2.0240 means signifies that they are were in bad condition.

4.3 Condition of available services in the tenement's houses

Condition of the services provided such as structure, finishing, aesthetics, accessibility, open space and materials used were examine either in they are very good; good; bad and very bad. Table 4.3 revealed that accessibility has a mean score of 1.9440 and standard deviation of .75460, finishing has a mean score of 1.9120 and standard deviation of .79326 and structure has a mean score of 1.9920 and standard deviation of 2.8834 which signifies that accessibility, finishing and structure were in good condition. Aesthetics has a mean score of 2.2240 and standard deviation of 1.10617, open space has a mean score of 2.0160 and standard deviation

of .75460 and materials used in building also has a mean score of 2.0240 and standard deviation of .93726, which signifies that Aesthetic, Open space and Materials used were in bad condition.

Table 4.2 Condition and States of the services

Variables	Mean	Std. Deviation
Structure	1.9920	2.88348
Finishing	1.9120	.79328
Aesthetics	2.2240	1.10617
Accessibility	1.9440	.75460
Open space	2.0160	.72938
Material used	2.0240	.93726

4.4 Adequacy of services in the houses tenements houses

Adequacy of building sizes, room sizes, wall types, floor types, toilet, kitchen, bathroom, water supply and electricity supply were also analysis based on very adequate, adequate, inadequate and very inadequate. Table 4.3 revealed that Bathroom has a mean score of 1.8880 and standard deviation of .70957, Water supply has a mean score of 1.9360 and standard deviation of .72672 and Electricity also has a mean score of 1.8240 and standard deviation of .70784 which signifies that Bathroom, water supply and electricity within the selected housing estate were adequate. Room size has a mean score of 2.0080 with standard deviation of .72397, wall type has a mean score of 2.1840 and standard deviation of 1.95260, floor type also has a mean score of 2.01600 and standard deviation of .76183, which signifies that room sizes, wall type, floor type toilets and kitchen were not adequate.

Table 4.3. Adequacy of the services

Sizes of building	Mean	Std. Deviation
Sizes of room	2.0080	.72397
Type of wall	2.1840	1.95260

Type of floor	2.0160	.76183
Toilet	2.1600	1.10278
Kitchen	2.4160	.97703
Bathroom	1.8880	.70957
Water supply	1.9360	.72672
Electricity	1.8240	.70784

4.4 Tenants' Satisfaction with Building Quality

The elements or variables which make up or determine the quality of a building also influence tenants" satisfaction with the building. The response given for the variables/elements which determine the quality of buildings as shown in Table 4.6 indicated that tenants were satisfied with the external construction quality (3.55), ventilation within building (3.55), internal construction quality (3.54) overall building quality (3.52) and wall quality (3.50). Meanwhile, the respondents were fairly satisfied with the floor quality" with (3.45), wiring quality (3.42), general lighting (3.37) and plumbing quality (3.14). However, tenant's overall satisfaction index for the building quality was 3.45 (fairly satisfied).

Table 4.4: Tenants' Satisfaction with Building Quality

Building Characteristics	Respondents opinions							
	(5) very satisfied	(4) Satisfied	(3) Fairly satisfied	(2) Dissatisfied	(1) very dissatisfied	N	SWV	MWV(x) = SWV/n
External construction quality	33	121	120	6	2	282	1023	3.62
Internal construction quality	29	111	131	8	3	282	1001	3.54
Wall quality	25	130	112	10	5	282	1006	3.56
Floor quality	29	121	120	10	2	282	991	3.51
Writing quality	23	121	120	14	4	282	991	3.51

General lighting	20	129	115	14	4	282	993	3.52
Plumbing quality	19	107	131	20	5	282	961	3.40
Ventilation within Building	20	131	120	10	1	282	1005	3.56
Overall building Quality	22	127	114	15	4	282	994	3.52

TSI = ∑ MWV/N = 31.74/9 = 3.52

4.5 Discussion

An assessment of the conflict's resolution amongst residents of tenement houses in Minna township was carried out. The most common causes of conflicts amongst residents of the faceme-I-face-you type of tenements residential houses in Minna is inadequate infrastructure, followed by non-settlement of electricity and neighbourhood levies, the costs of which the occupier share equally. It was discovered that Inadequate infrastructure contributes greatly as a source of conflicts. Many tenants scrabble for kitchen, bathroom, central passage, balconies, electricity and water supply, and other facilities that are available for common use. Planning regulation may be adopted to give advantage to approval of buildings with adequate infrastructure over those with few and inadequate facilities.It was found that co-tenants have important role to play in resolving conflicts amongst residents of low-income housing. This is an indication that involvement of cotenants in conflict resolution will go a long way at peace-making and prevent conflicts with using the Police except when life is threatened or there is potential breach of public peace and tranquility.

Seven types of conflicts occur amongst the residents of low-income housing in Lagos metropolis. The prevalent type of conflicts involves multi-parties (two families - parents and their children). Conflicts probably arise from little disagreement between two members of the families extending to other members of the conflicting parties. Multi-party conflicts involving two or more families are complex situations, and require careful intervention by neighbours and estate surveyors. In this case, one should expect settlement to take a bit longer time than if the conflict involves only two,

and greater precautionary measures must be in place to forestall individual conflict that may degenerate into crisis and breach of peace in the entire area.

5.1 Conclusion and Recommendation

The evaluation of tenants" satisfaction with tenements housing in Minna, has indicated that tenants were fairly satisfied with the tenement housing in the area. It could be observed that the environmental quality of most of the rental housing in the study area were in deplorable conditions. Therefore, the respondents could only claim to be satisfied with such areas as a matter of choice, since the respondents belong to different income groups, educational levels and occupation. It is always better not to manage any property at all than to manage crisis-infected ones! Time is valuable to the estate surveyor and time spent in resolving conflicts could better be diverted to rewarding ventures. Involving reliable residents in conflict resolution will prevent estate surveyor from expending time and energy on what is not worthy and enable them spend quality time on more rewarding aspects of the professional practice. The estate surveyor also has important role to play by ensuring that facilities provided by their clients are adequate before taking up the letting and management of a property while planning approving authorities must ensure that facilities provided in low-income tenement houses are adequate in relation to the number of tenants before approval is granted.The study recommends adequate policy formulation to guide and bring about sustainable rental housing provision as an alternative to home ownership in the study area and in Nigeria at large. The provision of qualitative housing, conducive, serene, aesthetically pleasing environment and neighborhood; good and acceptable management services by all stakeholders are pertinent to ensure adequate, effective and satisfactory housing in the study area.

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ASSESSMENT TECHNIQUES FOR SUCCESSIVE DELIVERY OF INTERNAL ELECTRICAL BUILDING SERVICE IN ABUJA, NIGERIA

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Abstract

Architectural drawings for residential buildings such as those of bungalows and duplexes are not usually accompanied with its corresponding detailed electrical drawings which have led cost engineers such as quantity surveyors/estimators to find a way of determining the cost of electrical services through the use of provisional sums which is more of a guess work. The study developed a cost model in determining cost impact of electrical services in residential buildings in Abuja. Quantitative research techniques were adopted. The study made use of architectural and electrical drawings which involved the generation of the priced bill of quantities from 33 drawings (architectural and electrical), current market prices and site-observed productivity constants for the development of the cost model for electrical installation cost for residential buildings. The findings show the coefficient of determination R^2 is 0.172; this shows that the equation is statistically insignificant and so therefore the gross floor area should not be used to estimate the final sub-circuits cost of residential electrical installations work. The findings recommends that floor area is not a good cost predictor of final sub-circuit cost and should therefore not be used in estimating for residential electrical installation costing.

Key Words: Successive Delivery, Internal Electrical and Building Service

1.0 Introduction

Electricity was a luxury for houses in the past, but it is a necessity for each and every house, irrespective of the scale or the category of the household. Within the Nigerian construction industry, the installation cost of an electrical system in a building is significant. Building services installations typically account for 20-30% of the total value of a project and sometimes a great deal more, (Simon and Andy, 2012). The complexity of building services installations has increased in recent years as demand has grown for

intelligently operated environments, driving innovation to improve occupier comfort and extend building performance.

Meanwhile, building services contracting is distinct from most other trades in terms of the role of direct labour, the relevance of the job undertaken by sub-contractors, the extent of coordination required between trades and the extent of design work that can be shared between consultants and specialists. Electrical installation in a general term means any fixed appliances, wires, fittings, apparatus or other electrical equipment used for (or for purposes incidental to) the conveyance, control and use of electricity in a particular place, but does not include any of the following; subject to any regulation made under *Electricity (Consumer Safety) Act 2004* subsection (4) – any electrical equipment used, or intended for use, in the generation, transmission or distribution of electricity that is: (owned or used by an electricity supply authority, or located in a place that is owned or occupied by such an authority); Any electrical article connected to, and extending or situated beyond, any electrical outlet socket; Any electrical equipment in or about a mine; Any electrical equipment operating at not more than 50 volts alternating current or 120 volts ripple-free direct current; Any other electrical equipment, or class of electrical equipment, prescribed by the regulations.

The electrical work in residential houses must be made, taking into account the particular interior design. In some cases, cables can be laid under the ceilings, while in others you will need to drill walls and floor. That is why execution of electrical works here requires an integrated professional approach that takes into account the requirements of operation, safety and aesthetic perfection as well. Part of the building regulations limit what electrical work may be carried out by anyone other than a professional electrician who is a competent person registered with an electrical self-certification scheme. Moreover, most architectural drawings for residential buildings such as those of bungalows and duplexes are not usually accompanied with its corresponding detailed electrical drawings which have led cost engineers such as quantity surveyors/estimators

to find a way of determining the cost of electrical services through the use of provisional sums which is more of a guess work.

Also, the non-availability of electrical drawings for residential buildings could lead to variations and loads of claims by the contractors in situations in which the estimated allowances for such electrical installations is found to have been underestimated; therefore, this paper aimed at developing cost models in determining cost impact of electrical services in residential buildings in Abuja.

Study Area

Abuja in the center of Nigeria and within the Federal Capital Territory (FCT) Abuja was built mainly in the 1980s. It officially became the Nigeria capital on 12th December 1991, replacing Lagos which is till the country's most populous city. It has Kaduna State by the north, Nasarawa State to the east, Kogi State to the south-west and Niger State to the west. It lies between 7°20′and 9°15′ North of the Equator and longitudes 6°45′ and 7°39′East Greenwich Meridian, Abuja is geographically located in the center of the country (Figure 1.1).

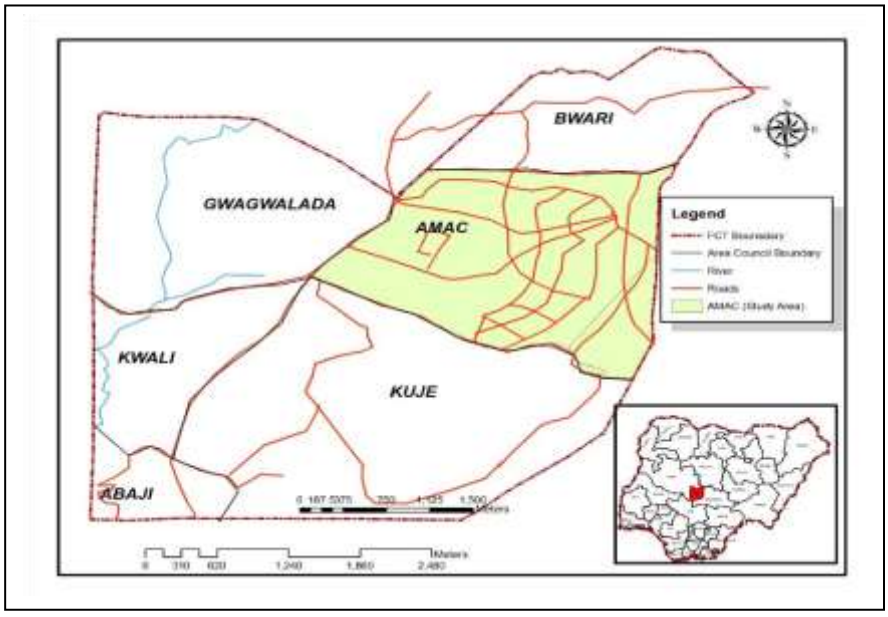

Figure 1.1: Location of Abuja
Source: FCDA, Abuja (2019)

2.0 LITERATURE REVIEW

2.1. Overview of Services in Residential Buildings

Building construction is a complex, significant, and rewarding process. It begins with an idea and culminates in a structure that may serve its occupants for several decades, even centuries. Like the manufacturing of products, building construction requires an ordered and planned assembly of materials. It is, however, far more complicated than product manufacturing. Buildings are assembled outdoors by a large number of diverse constructors and artisans on all types of sites and are subject to all kinds of weather conditions. Additionally, even a modest-sized building must satisfy many performance criteria and legal constraints, requires an immense variety of materials, and involves a large network of design and production firms. Building construction is further complicated by the fact that no two buildings are identical; each one must be custom built to serve a unique function and respond to its specific context and the preferences of its owner, user, and occupants (Tay & Ooi, 2001).

Design and construction are two independent but related and generally sequential functions in the realization of a building. The former function deals with the creation of the documents, and the latter function involves interpreting and transforming these documents into reality a building or a complex of buildings. Residential property refers to the housing /dwelling units for human habitation. Housing is regarded as social goods to be provided by the government and/or its agencies for the citizenry. In the event of the even increasing population and limited land, high rise residential block is being favoured to be able to accommodate a large number of people within a limited land space (unit

Mohd-Tawil et al. (2005) while quoting Jamila (1994) agreed that high prices of land in urban centres make high rise residential building inevitable and a more practical proposition from economic point of view. Population growth coupled with dwindling land stock make high rise living an alternative (Jamila, 1994). Multi–storey residential apartment is therefore seen as the appropriate decision to addressing the high demand

for accommodation in the midst of limited supply of land for development. Apartment towers and condominium and are the choice of high-income earners today. High rise residential property has its characteristic of multiple owner/occupiers and the involvement of specialist firm (company) for management of the properties and the accompanying facilities and services.

2.2 Service Delivery in Facilities Management

Facilities management is a fast-growing profession across the world. It is a cost cutting initiatives in the 1970s when outsourcing of services became to be popular (Noor & Pitt, 2009) Facilities management encompasses multiple activities under various discipline and combines resources which make facilities management vital to the success of organisations. Facilities management has been defined in past researches (Barrett, 1995; Becker, 1990; Nutt, 1999; Tay & Ooi, 2001; Then, 1999). Facilities management can be summarized to mean creation of an environment that is cohesive to carry out an organisation's primary operations taking an integrated view of the services, infrastructure services and use it to give customer satisfaction and value for money through the support for an enhancement of the core business (Alexander, 1999; Bell, 1990; Goyal & Pitt, 2007; Noor & Pitt, 2009). All the definitions of facilities management relate building to business activities and environment (business/commercial properties) but facilities management is applicable to residential properties too.

2.3 Service and Service Quality

"A service is an activity or series of activities of more or less intangible nature that normally but not necessarily take place in interactions between the customer and services employees and physical resources/goods/systems of the services provider (i.e. designed solutions to customer problems)" - (Wei, 2007). Quality of service is now the cornerstone of competitive strategies for the facilities management providers who are seeking to widen and secure their client base (Pheng 1996).

Quality service is related to the customers' need and expectations (Johnston & Clark, 2005; Kotler, 2003; Parasuraman, Zeithaml, & Berry, 1985, 1988, 1990) submits that service quality comprises five dimensions which if performed satisfactorily would help reduce the cost for monitoring the performance of service contractors (Lai, 2010). These five dimensions include Reliability, Responsiveness, Assurance, Empathy and Tangibles.

2.4 Measurement of Service Quality

Customer satisfaction or dissatisfaction depends on achieving or not achieving three levels of expectation which are implicit, explicit and talent (Wei, 2007). Measurement of service quality and/or service delivery provides the basis for answering two fundamental questions:

a. Is what is being done worth doing?
b. Has it been done well?

Measuring performance has an important role in measuring past achievements and providing the basis for planning and control decisions (Cole, 2000). Measurement of service delivery/performance is aimed at establishing the satisfaction of clients or users of a product and services. This is done by comparing the actual perception of the service/product against the expectation of the users. The degree of discrepancy between consumer's perceptions and expectations dictates the service quality and level of satisfaction of consumers/users of the products/services. The service quality (SERVQUAL) model can be adapted for use in measuring the service quality of facilities management services. In Facilities management, customer satisfaction is the key deliverable to success of fulfilling contractual obligation (Siu, Bridge, & Skitmore, 2001; Wei, 2007).

3.0 Methodology

The scope of this study is such that there might not be available data for this class of building; surrogate cost data will be made use of as opposed historical cost data for the development of the model. This involves the generation of the priced bill of quantities

items from 38 drawings (architectural and electrical), (that is, 20 bungalows and 18 duplexes); current market prices of electrical items, site-observed productivity constants and relevant interviews with technicians and electrical engineering constants.

3.1 Sampling Size and sampling techniques

The sample size for the data is 49 floors of 17 bungalows and 16 duplexes architectural and electrical drawings. The unit of analysis is floors with its own distribution boards (selfsufficient residential floors). A convenient sampling technique was used in carrying out this research, this is because there is no list of electrical residential floors designs by electrical technicians. Therefore, caution must be exercised in generalizing the result of this research as a result of the sampling technique used.

3.2 Data Collection Instrument

This study made use of architectural and electrical drawings which involved the generation of the priced bill of quantities from 33 drawings (architectural and electrical), current market prices and site-observed productivity constants for the development of the cost model for electrical installation cost for residential buildings. More so, a table of various headings was used in gathering and collection of surrogate cost data of current market prices of electrical items, site-observed productivity constants of electrician technicians.

3.3 Data Analysis

Regression Analysis according to Mason *et al* (2013) is the general process of predicting one variable based on another variable. It may also be said to be a technique that will find a formula or mathematical model which best describes data collected. The factor whose value we wish to estimate (e.g. aggregate scores) is referred to as dependent variable and denoted by Y. the factor from which these estimates is made is called the independent variable and is denoted by X.

4.0 Results

4.1 Data Analysis

The individual cost item of the lighting electrical installation, including the cost of switches and the final sub-circuit cost are tabulated and analysed using arithmetic mean and regression analysis. The results of these findings are presented to form the model needed for this research work. Also, a Pearson Correlation analysis was carried out to investigate the relationship between the final sub-circuit costs and the predictor variables. The results of this study were however established from the result of the analysis and conclusion drawn to arrive at the basic facts of findings. The statistical breakdowns of data collected are shown in figure 1, 2 and Table 1.

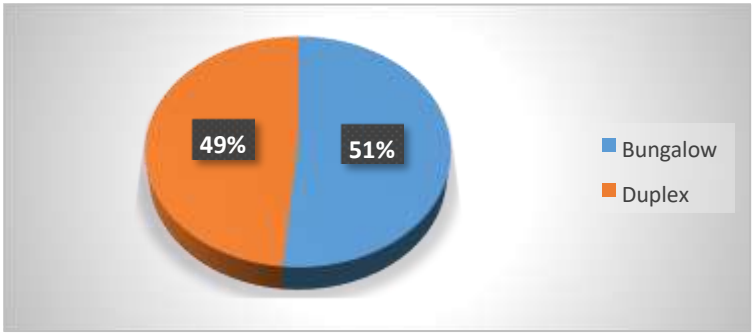

Figure 1 Based on Building Type

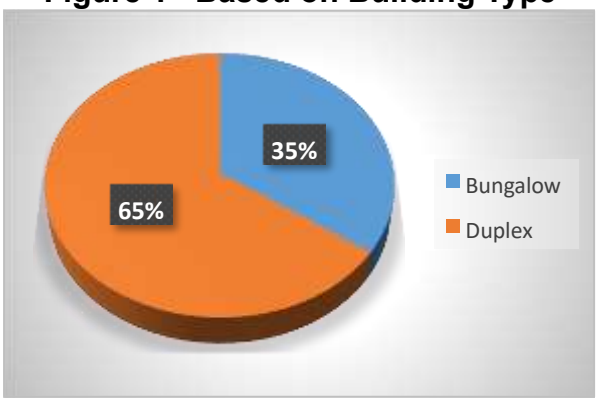

Figure 2 Based on Floor Classification

TABLE 1. CROSS-TABULATION: Building type to Number of Bedrooms

NUMBER OF BEDROOMS * BUILDING TYPE				
		BUILDING TYPE		TOTAL
		BUNGALOW	DUPLEX	
NUMBER OF BEDROOMS	Two bedroom	4	0	4
	Three bedroom	8	1	9
	Four bedroom	5	10	15
	Five bedroom	0	5	5
TOTAL		17	16	33

4.2. Identification of the Cost Significant Items

Meanwhile, the identification of the cost significant variables used in the formulation of the developed model follows the technique proposed by Sheref and Pareto that items are considered as significant when their value is higher than, or equal to, the mean bill value. The Mean (x) =

equation goes thus:

$$:) = \frac{\sum xi}{n} \quad \text{csi} \geq \text{mean value}$$

Where; $xi = x1, x2, x3, x4 \ldots\ldots xn$ $(items\ of\ work\ in\ the\ BOQ/BEME)$

n = number of items and ***csi*** = cost significant items

Work at the University of Dundee also show that BOQ's analysed using this technique are successful with the identification of the significant items that constitute 80% of the

contract sum. Below is the table showing the cost significant items of work for the fortynine floors of bungalows and duplexes derived from calculation.

4.3 Model of electrical installation cost as a function of the cost significant items.

Given the quantities per project for the predictor variables, the regression model predicted the total cost in Naira for the electrical installation work, based on three statistically significant variables as shown in Table 2 and 3 below, where the p-values for all coefficients considered in the model are less than or equal to 0.075:

TABLE 2 Multiple regression results among the electrical costs & cost significant items *(for Bungalows and Duplex* First Floors)

REGRESSION STATISTICS		VARIABLES	COEFF.	P-VALUE
No. of observations	33	Number of Luminaries (item)	751.796	0.000
R-square	0.968	Length of Cables (m)	44.615	0.041
Adjusted R-square	0.965	Length of Conduits	618.358	0.000
F	292.229			
		Constant	**1407.866**	**0.400**

The multiple regression equation is; $Y = c + bX_1 + bX_2 + bX_3$.....**MODEL 1a**

The Predicted equation is; $Y = c + b_1X_1 + b_2X_2 + b_3X_3 = 1407.866 + 751.796X_1 + 44.615X_2 + 618.358X_3$

Where;

Y= Total cost of final sub-circuits (lighting circuits) (in Naira)
X_1= Number of luminaries (m)
X_2= Number of cables (m)
X_3= Number of conduits (m)
Regression constant = 1407.866

Evaluation of the predictive validity of the model

- Coefficient of correlation (R) is 0.984; this shows that there is 98.40% relationship between the dependent and independent variable. That is, the model indicates a very high level of correlation.
- Coefficient of multiple determination (R^2) is 0.968; this shows that 96.80% of the dependent variable is explained is explained by the independent variables. This indicates that there is a very high degree of fitness of the regression plane to sample observation and that only 3.20% is explained by other variables not included in the model
- The equation is statistically significant and so the estimated final sub-circuit costs of electrical installation works using the model will be realistic.

Table 3 Multiple regression results among the final sub- Circuit costs & cost significant items *(Duplex Ground Floors)*

REGRESSION STATISTICS		VARIABLES	COEFF.	P-VALUE
No. of observations	16	Number of Luminaries (item)	1020.408	0.005
R-square	0.980	Length of Cables (m)	72.364	0.588
Adjusted R-square	0.975	Length of Conduits	303.168	0.029
F	195.907			
		Constant	**3601.236**	**0.557**

The multiple regression equation is; $Y = c + b_1X_1 + b_2X_2 + b_3X_3$.....**MODEL 1b**

The Predicted equation is; $Y = c + b_1X_1 + b_2X_2 + b_3X_3 = 3601.236 + 1020.408X_1 + 72.364X_2 + 303.168X_3$

Where;

Y= Total cost of final sub-circuits (lighting circuits) (in Naira)
X_1= Number of luminaries (m)
X_2= Number of cables (m)
X_3= Number of conduits (m)
Regression constant = 3601.236

Evaluation of the Predictive Validity of the Model

- Coefficient of correlation (R) is 0.990; this shows that there is 99.00% relationship between the dependent and independent variable. That is, the model indicates a very high level of correlation.
- Coefficient of multiple determination (R^2) is 0.980; this shows that 98.00% of the dependent variable is explained by the independent variables. This indicates that there is a very high degree of fitness of the regression plane to sample observation and that only 2.00% is explained by other variables not included in the model
- The equation is statistically significant and so the estimated final sub-circuit costs of electrical installation works using the model will be realistic.

Also, the sample relationship between final sub-circuit cost and the number of luminaries (for both tables 4.5 and 4.6) is positive, since the coefficient of the number of luminaries (b_1 =751.796 and b_1=*1020.408*) is positive for both. This means that the estimated value

of the final sub-circuit cost increases by about 751.8 and 1020.4 respectively for every 1unit increase in the number of luminaries, holding all other items of work constant.

CONCLUSION

This study aims at modelling the costs of final sub-circuits in residential electrical installations using multiple regression technique. The models were developed based on forty-nine floors of thirty-three set of data (17 bungalows and 16 duplexes, of architectural and electrical drawings) collected from professionals working and validated using data of seven (7) floors consisting of three (3) bungalows and two (2) duplexes. Such types of models are very useful, especially in its simplicity and ability to be handled by calculator or a simple computer program. It has a good benefit in estimating electrical installation cost at early stages of the residential building electrical installation works since the information needed could be extracted easily from scope definition of such installation.

It must be remembered that an estimated electrical project cost is not an exact number, but it is opinion of probable cost. The accuracy and reliability of an estimate is totally dependent upon how well the scope is defined and the time and effort expended in preparation the estimate. The aim of this study was achieved by the generation of two multiple regression models both of whom uses the cost-significant items to determine the final sub-circuits costs; one of the multiple regression models took care of the bungalows floors and also the duplexes first floors (as both are quite similar); while the second one took care of the duplexes ground floors.

The coefficients of determination, R^2 for the first developed model (Model 1a) is 0.968 which indicates that the relationship between the independent and dependent variables of the developed model is good and the predicted values from a forecast model fit with the real-life data. The coefficients of determination, R^2 for the second developed model (Model 1b) is 0.980 which also indicates that the relationship between the independent and dependent variables of the second developed model is also good and the predicted values from a forecast model fit with the real-life data.

Based on the models generated for this research, the following recommendations are made;

- The floor area is not a good cost predictor of final sub-circuit cost and should therefore not be used in estimating for residential electrical installation costing.
- The determination of the cost model for the final sub-circuits costs lies heavily on the accurate determination of the number of luminaries to be used in a residential building floor which correlates with BESMM3 measurement rule (M7) for Y61-
- The cost model is adequate and fit to be used for the forecast of electrical (lighting) installation works in the early stages of the residential building design and in situations where no or less detailed electrical plans are available.

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