

USER SATISFACTION IN LOW/MIDDLE INCOME HOUSING, JOS, NIGERIA(A CASE STUDY OF OLD LEGISLATIVE QUARTERS, JOS)

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Abstract: This study examined the effect that spatial perception has on residents of low and middle class housing in a housing estate in Jos. Several factors affected spatial perception including sociological needs, psychological state and individual differences. A major factor the study considered was the environment which also influenced human behaviour even as both mental and physical stimuli affected behavioural responses; providing an insight into the relationship between user perceptions of spatial design and satisfaction with the residential units. Using mixed methods, two randomly selected sample populations completed questionnaires concerning the awareness of the influence on spatial design on their behaviour in the residential units in Old Legislative Quarters, Jos. This was achieved using Likert scales in the self-administered questionnaires. Data was divided into four broad sections, with each section containing variables such as socio-economic data, spatial perception, population and condition as well as the effect of some factors on behaviour. The qualitative approach was used in the form of the case study approached in order to evaluate the effects of spatial perception on the behaviour of the students. From the findings it was deduced that good architectural design can only be achieved when architects observe and are as interested in the occupants of the buildings they design as the buildings. **Key words:** *Effects, Human Behaviour, spatial design, user perceptions*

INTRODUCTION

Housing can be defined as a shelter to contain and support people. It is generally accepted to be one of the basic needs of man after food and clothing; it can also be defined as a structure in which people are housed (Windapo Ogunsanmi and Iyagba, 2004). To a large extent, it is also made up of, not only the physical structure, but also the immediate environment (i.e drainages, sanitation, recreational activities and all other

E. O. Ola-Adisa et al.,

social activities that encourages man's way of life. Space is that which brings people together and simultaneously that which separates us from each other (Lawson, 2001). Hence it can be said that space is a language and although it has social and cultural variations, it is obtainable and can be observed all over the world wherever and whenever people come together. Hence, it is very important for buildings to properly speak the language of space. This is because, the way individuals perceive a space, will often tell them how to behave within the particular enclosure. This is due to the fact that space creates settings which organize our lives, activities and relationships and this is obviously without our noticing or consent. It is however, noteworthy that not all behaviour in space involves conversation, but much of our behaviour in space involves communication in some way or the other, that is verbal, or non-verbal communication. It can therefore be deduced that a good architectural design can only be achieved when architects observe and are as interested in the occupants of the buildings they design as the buildings. Architects must understand their clients and users and hence, design should not be done for people, but with people (Markus, 1993).

Hall (1966) observed user behaviour and space utilisation, through sensitive behaviour observation in natural settings, that there is an important spatial dimension to human communication. He observed, for example, that how far or how close people stand reflects their social relationship, distance generally meaning coldness and closeness generally meaning friendliness. Further behaviour observation turned this rather simple conclusion into an exciting insight: the way people from different cultures interpret spatial distances can lead to misunderstanding, even insult. For instance, a residential space required in Nigerian residential units may be different from the requirements of their Western counterpart. Whereas the Westerner may like large spaces the Nigerian prefers more intimate spaces. When the cultural and religious aspects are included, the northerners' space utilisation may differ from that of his southern counterpart due in part to climate, culture and religion. Therefore, this study aims at exploring the way individual perception of an architectural space influences human behaviour as well as the way it mediates our relationships with each other and also to establish architectural space and design as a container to accommodate, influence, structure and organize as well as facilitate human spatial behaviour in the residential units.

Housing can be defined as a shelter to contain and support people. It is generally accepted to be one of the basic needs of man after food and clothing; it can also be define as a structure in which people are housed (Windapo *et al*, 2004). To a large extent, it is also made up of, not only the physical structure, but also the immediate environment i.e. drainages, sanitation, recreational activities and all other social activities that encourages man's way of life. Over the years, it has come to light that in the design of spaces in architecture, the human dimension of space has been to some extent overlooked. This is due to the fact that more attention has been paid to the influence of architecture on its external environment and context, than its influence to its residential units and its users as well as their relationships with one another. Hence, it can be said that space, and consequently that which encloses it, are much more central to all of us in our everyday lives than purely technical, aesthetic or even semiotic interpretation would suggest (Lawson, 2001). The human language of space, whilst it has its cultural variations, can be observed all over the world wherever and whenever people come together. In particular in this study the major aim is the space created in and around architecture. Architecture organizes and structures space for humans. Hence, the distinction between the way space is perceived and the way that it is defined is a significant determinant of the architectural experience. This distinction allows the limitations of space to be questioned visually since space may be defined differently than it is perceived.

Subsequently, architectural spaces can also be seen as containers that accommodate, separate, structure and organize, facilitate, heighten and even celebrate human spatial behaviour. In so much as they do that, they can also be viewed as psychological, social and partly cultural phenomena (Lawson, 2001). Markus (1993), established in his fascinating treatise on 'buildings and power', that buildings are not primarily art, technical or investment objects, but also social objects, as each person responds uniquely when confronted with a specific situation or experience. Therefore, the purpose of this study is to not only look at human relationship with architecture but at the way architecture mediates our relationships with each other as determined by the way we perceive and interpret spaces. The aim of this study is to investigate the influence of spatial perception on user satisfaction in the Old Legislative Quarters, Jos, Nigeria, in order to establish to what extent such influence can be

generalized about all residential units as well as proffer solutions that will make living in the low cost housing a satisfying experience.

THE LANGUAGE OF RESIDENTIAL SPACE

Residential space, with all the cultural variations, basically consists of enclosures to provide shade shelter and storage for the inhabitants. Interior Architecture can facilitate or inhibit human activities and their satisfaction with the spaces. Available literature shows that “interpersonal environment was more important than cleanliness and maintenance variables in predicting user satisfaction with their residence experiences”, making buildings are as much a social as a physical phenomenon (Proshansky, 1970; Li et al., 2007). Buildings (particularly residential) can be said to speak a language, which can either be welcoming to the users or otherwise. Hence, the indoor residential space of buildings can fail to speak the language of space properly just as much as people can. Residential space is often means for change of mood, establishing relationships, separate activities, and suggesting or inviting appropriate behaviour (Ola-Adisa et al 2015). Therefore, in the design of spaces, architects must have awareness to the language of space and must be able to watch what people do, as it is for people that buildings are designed and so care should be given to creating more spaces which help people and fewer that obstruct them.

SPATIAL PERCEPTION

Robson (1999) states that people are continuously receiving input from their environments and this enables them make conscious and sub conscious decisions based on their perceptions. These inputs enable people determine what actions and attitudes are most appropriate. Positive spatial perception enables one relate to the arrangement of one’s surroundings. This ability enables one to keep a distance from objects to avoid colliding with them. People and other living beings are constantly aware of their positions relative to the positions of others, and spatial perception provides people with cues, including depth, distance which aid movement and orientation within the environment. Space perception gives insight into ways that perceptual behaviour provides orientation the individual to the environment. Specifically, orientation in space typically seems to reflect one’s strivings (e.g., to seek food or to avoid injury). People could not orient themselves to their environments, however, unless the environmental information reaching them through the various sense organs offered a perception of space that corresponds to their

physical “reality.” Such perception is called veridical perception which is the direct perception of stimuli as they exist. Without some degree of veridicality concerning physical space, one cannot seek food, flee from enemies, or even socialize. Veridical perception also causes a person to experience changing stimuli as if they were stable: in other words, one perceives objects in the environment as having relatively constant characteristics (as to size, colour, and so on) despite considerable variations in stimulus conditions.

How a person interprets space is therefore a phenomenological experience that goes beyond the limitations of psychological confinement. Smell and taste are consequentially linked to a sense of place by understanding how the brain works and remembers past experiences. To smell and to taste are past, spatial perceptions linking to present; rather visuals, touch, and sounds are descriptive characteristics that exist in the present. Spatial explorations while utilizing one’s senses are indeed manipulated by user satisfaction which is controlled by social, physiological and his or her physical inadequacy. Hence, how a person perceives something and what it perceived would be impossible without the five senses. Hence, spatial perception is affected by sociological needs, psychological state, and individual differences. There are three modes of perception in human beings

- a. operational mode, in which we concentrate on only those elements of the environment that are important to accomplishing a task
- b. responsive mode, which includes our everyday noticing of things around us; and
- c. inferential mode, in which we focus our attention on those elements that support our knowledge of an environment (Robson, 1999).

Robson stated that an environment, which provides information on all three levels, is a successful environment especially when it also relates to things that are familiar and understood from previous experiences.

EVALUATING USER SATISFACTION IN RESIDENTIAL SPACES

User satisfaction refers to the range of behaviours exhibited by humans and which are influenced by culture, attitudes, emotions, values, ethics, authority, rapport, persuasion, coercion and/or genetics (Tangney, 2007). User satisfaction is translated through the means of verbal and non-verbal communication. Hence, the behaviour of people falls within a range with some behaviour being common, some unusual, some acceptable, and

some outside acceptable limits. Behaviour in this general sense should not be mistaken with social behaviour, which is a more advanced action, as social behaviour is behaviour specifically directed at other people. The acceptability of behaviour is evaluated relative to social norms and regulated by various means of social control (Lawson, 2001). The behaviour of humans is studied by the academic disciplines of psychiatry, psychology, social work, sociology, economics, and anthropology. User satisfaction is experienced throughout an individual's entire lifetime. It includes the way they act based on different factors such as genetics, social norms, core faith, and attitude. Behaviour is impacted by certain traits each individual has. The traits vary from person to person and can produce different actions or behaviour from each person. Social norms also impact behaviour. Humans are expected to follow certain rules in society, which conditions the way people behave. There are certain behaviours that are acceptable or unacceptable in different societies and cultures. Core faith can be perceived through the religion and philosophy of that individual. It shapes the way a person thinks and this in turn results in different user satisfactions. Attitude can be defined as "the degree to which the person has (Li, 2005) a favourable or unfavourable evaluation of the behaviour in question." Your attitude highly reflects the behaviour you will portray in specific situations. Thus, user satisfaction is greatly influenced by the attitudes we use on a daily basis. User satisfaction is also affected by certain factors and these influence behavioural responses: this are in the form of mental and physical stimuli(Ola-Adisa et al 2015).

FACTORS THAT INFLUENCE USER SATISFACTION IN RESIDENTIAL SPACES

There are several factors that influence or determine user satisfaction in residential spaces including genetics, social norms, core faith and culture and attitude. Proxemics refers to the study of man's appreciation and use of space. The term "proxemics" was coined in the investigation of man's use of personal space in contrast with "fixed" and "semi-fixed" feature space (Hall, 1966). Fixed feature space is characterized by unmovable boundaries (divisions within an office building) while semi-fixed feature space is defined by fixed boundaries such as furniture. Informal space is characterized by a personal zone or "bubble" that varies for individuals and circumstances. While the use of each of these spatial relationships can impede or promote the act of communication, the area that humans control and use most often is their informal space. This zone constitutes

an area that humans protect from the intrusion of outsiders. The study of spatial territory for the purpose of communication uses four categories for informal space: the intimate distance for embracing or whispering (1524 mm - 4572 mm), the personal distance for conversations among good friends (450 mm-1200 mm), social distance for conversations among acquaintances (1200 - 3600 mm), and public distance used for public speaking (3600 mm or more).

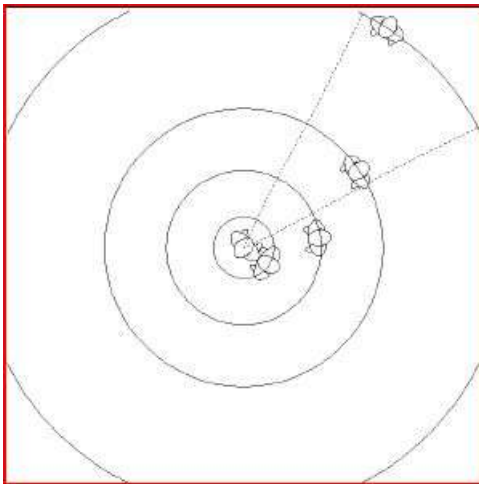


Figure 1: Levels of space: intimate, personal, social, and public.
Source- (Lawson, 2001)

Behavioural study indicates that individuals perceive a distance that is appropriate for different types of messages; they also establish a comfortable distance for personal interaction and nonverbally define this as their personal space. Studies suggest that the violation of this personal space can have serious adverse effects on communication. Thus, if an individual is to be mutually satisfied in a communication encounter his/her personal space must be respected. Should an intruder invade this personal space while also trespassing within territorial boundaries he placed himself in double jeopardy and must compensate for the other's increased anxiety (Ola-Adisa et al 2015)A typical residential unit in Nigeria is usually not reflective of the levels of space that make a space comfortable for the user. Therefore the proxemics in the space may have a positive or negative impact of user satisfaction on that particular space.

THE COMMUNICATIVE BEHAVIOUR OF MAN

Sobocinski (2010). asserts that due to our makeup, human beings possess a particular set of senses with varied specialization and sensitivity to

E. O. Ola-Adisa et al.,

stimuli. As we are descendants of fruit eaters and hunters, sight is our primary sense, followed by the auditory and olfactory. Although our ability to recognize shapes, textures, and temperatures is also impressive, the tactile is limited to our skin and our closest vicinity, making the touch inferior in comparison with the previously mentioned senses. The taste, finally, from the perspective of communication, is nothing more but a confirmation of everything else that has already been assessed by other senses. One could also mention the sixth sense relating it to our knowledge and/or education which enable us to draw far-reaching conclusions on the basis of tiniest stimulus even when registered by a single sense. When human beings are treated as a society, and communication between both individuals and groups is considered the primary focus of an analysis, then it is necessary to mention language as the main means of transmitting information. Moreover, language together with other non-linguistic behaviours functions as the unifying element enabling societies to thrive and progress despite the obvious inability to come in sensual contact with all members of such vast groups as nations. It seems that it is the combination of language as the means of communication together with the sight and the auditory channels of communication at the core of studying human communicative behaviour. For this reason it seems appropriate to divide signs and messages present in our environment into those dwelling on the sight or the auditory together with references to language. In result one receives: visual non-verbal communication, non-verbal non-visual communication, verbal non-visual communication, and visual verbal communication (For a variety of reasons, “verbal” is preferred to “linguistic” as there are numerous non-linguistic verbal behaviours that otherwise could not be included in the following analysis).

The first of dominant channels of communication consists of those signals, signs, and messages which are perceived by the sight and which lack the verbal (and linguistic) element. If face-to-face interactions are taken into account, one could list all the visual characteristics of interlocutors: their body language, posture, constitution, clothing, jewels and other elements signifying status or identity, health indicators, etc. In accordance with the proverb “one picture is worth a thousand words”, a glimpse at a person gives off a significant number of signs that can become meaningful to a skilled reader. There is, however, another facet to visual non-verbal communication when it is not the other human being at the centre of one's focus but signs left by them. Urban

environment is a cornucopia of signals, signs, and messages which are visual in nature and are not based on verbal or linguistic communication. From obvious lines on streets, to post boxes attached to walls, to whole buildings, and arrangement of city districts, all elements of our surrounding within cities seem to communicate a plethora of meanings (Sobocinski, 2010).

Non-verbal non-visual communication type of communication is usually noticed while travelling across a foreign country in connection with a language barrier. The multitude of sounds present in cities is amazing, however, they usually can be limited to just a scant group produced by machines, tools, and vehicles. From the perspective of communicative behaviour of man, this type of communication seems to be of little interest as only a selection of sounds created by, e.g., a man mowing his lawn or a youth starting his motorbike, can be connected to people. Usually the only relation that can be found is that of status or physical work indicated by sounds. There is also a fairly impressive group of olfactory signs present at particular places, times, or in relation to people, but as mentioned above, these are purely non-linguistic, and are of little interest in the presented analysis (Sobocinski, 2010).

Typically approached as the most important, this mode of communication is usually concentrated around language. It would be highly difficult to claim that it is not our daily routine to chat and converse, discuss and argue, that constitutes the major part of verbal non-visual communication. Nevertheless, there is a substantial undertone the non-linguistic verbal signs may give to linguistic messages. Depending on the tone and voice qualities, the extra linguistic element of speech enables to judge if the utterance is ironic or not, if it is an attempted lie or just boasting. Moreover, one can fairly accurately pinpoint the interlocutor's age, sex, health, and size, together with some hints about such remote issues as profession, e.g., in case of priests or newsreaders. Although this type of communication does not seem to be central to inter-human exchanges, it focuses attention on particular attitudes and prepares ground for further interactions.

In practice, when urban environment is taken into account, visual verbal communication seems to be of primary importance. The sheer amount of signs and messages posted on our streets and on building façades makes the previous modes of communication of secondary importance. When

standing on a street it is impossible to discern individual talks around us, the auditory and olfactory provide us with the background understanding of our surrounding, and it is the omnipresent notes at lampposts, bus stops and shop windows that are instantly recognized and that can be read and analysed without any delay most of the time. In addition, there are a vast number of signs that usually are unnoticed, that are transparent to the majority of passers-by. These are the signs left by and for various municipal institutions and servicemen who maintain the urban environment for us. There are also signs left by various non-municipal institutions, industries and commercial enterprises directed towards their employees - again most of those notices are transparent and unnoticed by those who are not intended addressees of such messages. Finally, there is a large group of previously mentioned non-verbal visual messages which can easily be transformed into particular utterances or that even have specific optional verbal equivalents. To some extent these could be treated as semi-verbal visual signs in urban environment. In general, it is all those signs together, creating a conglomerate that comprises the largest group of urban signs. The division of various types of communication offered above also deals with the evolution of human communication. As far as we can envisage it, at the beginning, early humans communicated using grunts and gestures, so the verbal and the visual without (strong) linguistic undertones were at the centre of communicative competence. Later, when language developed, the creation of complicated sets of beliefs and their dissemination became possible. Next, when script was used for the first time, and later, when print became widespread, we could notice a return to the visual without losing the primacy of the linguistic element. Finally, in modern times, our cities give off a number of signs referring to us as society, institutions, and individuals. This is achieved by a collection of signs, primarily visual and verbal in their nature, with some non-verbal elements inherited from the beginnings of human communicative behaviour. In addition, there is the whole sphere of online communication which again is primarily visual and linguistic (Sobocinski, 2010).

METHODOLOGY

This study adopted mixed methods the first of which was the qualitative case study approach in analysing the effects of spatial design on human behaviour in the residential units the Old Legislative Quarters, Jos, Nigeria. Old Legislative Quarters was selected due to the variations in design and the manageable scale of the housing quarters. The age of the

quarters was also a consideration to increase the level of spatial perception and the factors that influence human behaviour were considered and analysed using a quantitative approach. The study design involved two sample populations who completed questionnaires concerning the awareness of the influence on spatial design on their behaviour in the residential units: their residences to be specific as influenced by their level of spatial perception. This was achieved using Likert scales in the questionnaires the residents completed themselves. The questionnaire which was used to gather data was divided into four broad sections, with each section containing variables such as socio-economic data, spatial perception, population and condition as well as the effect of some factors on behaviour. Data collection was approached randomly with fifty questionnaires equally distributed in Old Legislative Quarters.

The selected types of residential spaces for this study were the Old Legislation Quarters, Eto Baba Road in Jos North Local Government Area Jos. This study examined the manner in which the spatial design of these houses has contributed to user satisfaction for users of these spaces. It also attempted to provide answers to the way that the perception of spatial character, elicits a certain behaviour in the occupants of a space. The criteria consists of Spatial quality, Spatial organisation, Spatial dimensions, Design form and Building character

Study Area

Old Legislative Quarters is located along Eto Baba Road (off Bauchi Ring Road) in Jos North Local Government, Jos, Plateau State (Plate i). The Old Legislative Quarters consists of one, two and three bedroom bungalows. Each residence has living room, dining room and bathrooms. The walls are made of hollow blocks and the interior walls are painted. The One Bedroom unit was originally designed to house a single resident, but typically accommodates a family of between three and five people. The Two Bedroom unit was originally designed to house a family of three residents, but typically accommodates a family of between five and six people, while the Three Bedroom unit was originally designed to house five residents, but typically accommodates a family of between six and eight people.



Plate i Old Legislative Quarters Aerial View

Source: Google maps (2018)

RESULTS

Data from the questionnaire, using a five point Likert Scale recorded perceptions of respondents on a range of attitudinal questions about the adequacy of the spaces and the user satisfaction of the given facilities

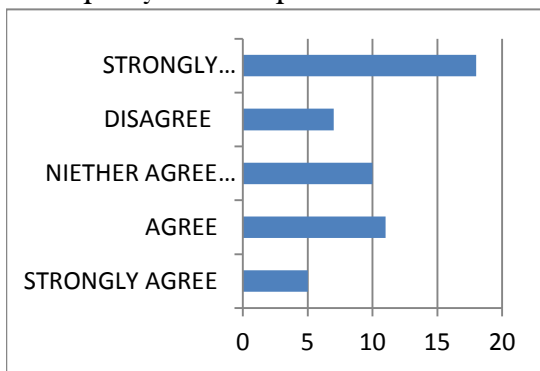


Figure 2: Acceptability of Bedroom headroom

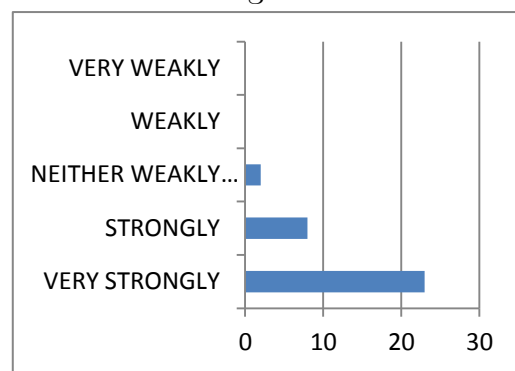


Figure 3: Appropriateness of intra residence privacy

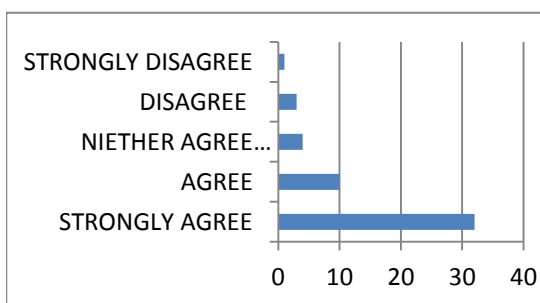


Figure 4: Residential design has effect on residents

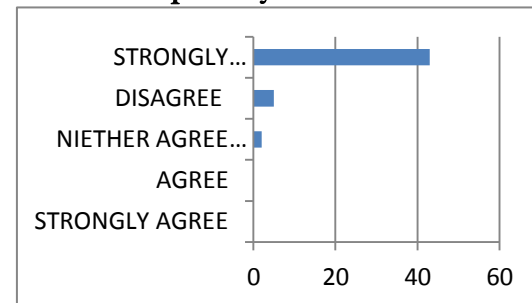


Figure 5: Adequacy of room condition

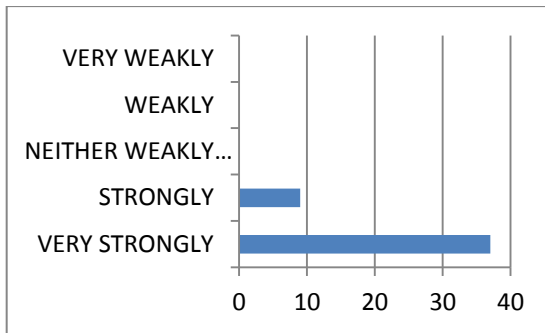


Figure 6: Appropriateness of Ventilation

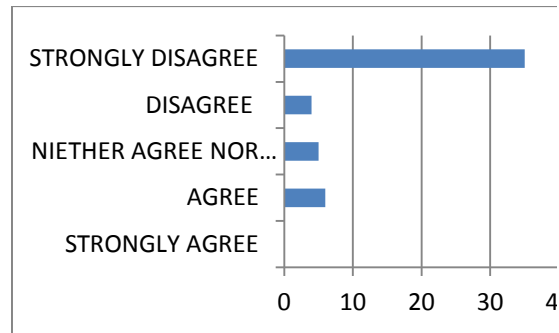


Figure 7: Adequacy of house size

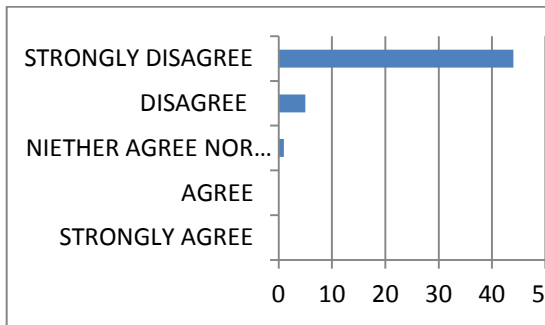


Figure 8: Adequacy of storage

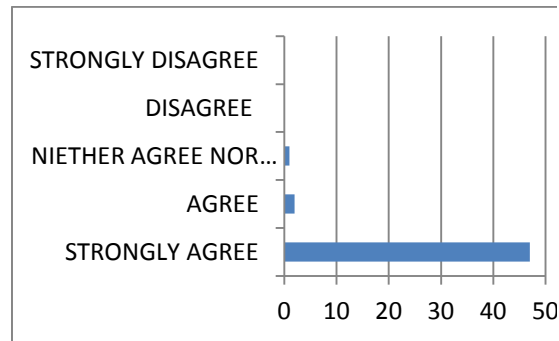


Figure 9: Preference for larger room size

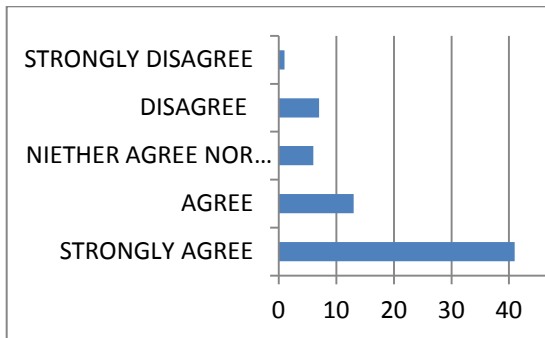


Figure 10: Positive relationship with residents

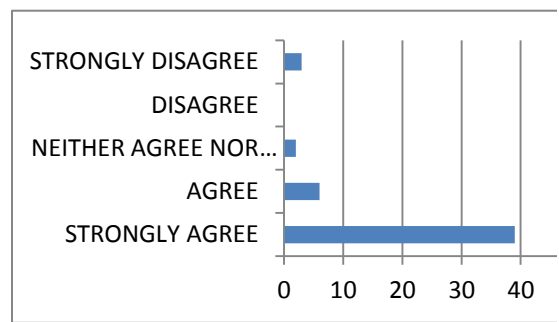


Figure 11: Residents responsibility towards estate

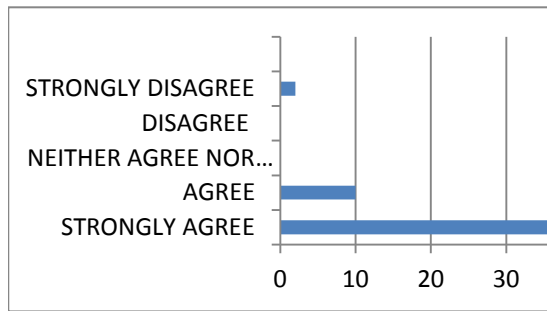


Figure 12: Architectural Design has effect

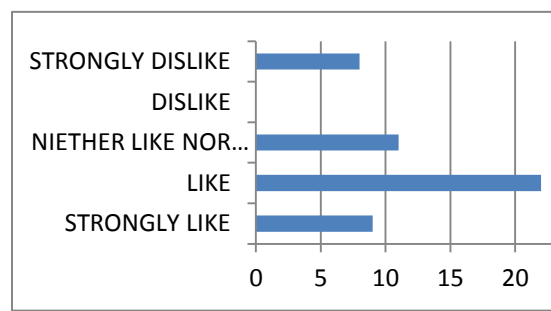


Figure 13: Residents perception of residential units

DISCUSSION

The primary purpose of this research was to identify the effects of spatial perception on the behaviour of the residents in the Old Legislative Quarters, Jos, Nigeria. The study also identified what factors within the residence rooms influenced positive or negative behaviour.

The data that was collected was divided into four sections: socio-economic data, awareness of spatial perception, room size, allocation physical condition and human behaviour. When the data from the questionnaires was analysed, using the mean, mode and percentages which were presented using pie charts, bar charts and column charts as tools.

In the study, significant differences were found between the occupants of the three bedroom and two bedroom residences level of spatial perception and behaviour.. On the variable of awareness of spatial perception, there was no significant difference as roughly the same number of the sampled population in Three bedroom unit responded positively like the sample population in Two bedroom unit positively. The possible explanation of this finding is the fact that most people are quite ignorant of what spatial perception is though they are grossly affected by it. For the next variable which is the room size and allocation showed very similar results between the two sample populations, as in Two bedroom unit majority of the sampled population were dissatisfied with the size of their rooms and were of the opinion that fewer residents should be allocated to the rooms. For Three bedroom unit most of the sampled population were dissatisfied with their room sizes and wanted bigger rooms to accommodate their families. These findings are consistent with Baron et al. (1976) and Okoli, (2011) who explored the impact of social

density on residents' perception of crowding. Their results revealed that "residents expressed greater feelings of crowding, perceived less control over room activities, expressed more negative interpersonal attitudes, and experienced a more negative room ambience". For the variable of satisfaction with the physical condition of the bungalows, comfort and privacy, the majority of the respondents from both bungalows were dissatisfied. However, in the variable of human behaviour as affected by variables such as culture, attitude, social norms, religious beliefs, verbal and non-verbal communication, it was discovered that majority of the respondents in Three bedroom unit responded to the affirmative as compared to the Two bedroom unit respondents. This finding goes on to validate the hypothesis earlier stated.

The overall result of the study goes on to show that most of the residents prefer the three bedroom unit. However, there are some limitations of the study. First, only two types of bungalows were selected in this study; therefore, the generalizability of the findings is limited. Secondly, more female respondents were used in the study. Further investigations should include equal number of males and females. Despite the limitations, it can be safely concluded that the findings indicate that there are significant differences in the behaviour among residents living in the residential units. From the findings, it can be seen that although a significant number of the residents are aware of what spatial perception is, and of its effects on their behaviour, quite a handful are ignorant. This nevertheless, does not avert the fact that the way an individual perceives an environment will greatly influence his behaviour in it. It can be observed that their perception of their rooms as influenced by factors such as the room sizes, number of people allocated per room, the physical condition of the rooms differ significantly as these conditions differ in the two bungalows.

As was discovered through the survey, the majority of the residents Old Legislative Quarters were displeased with their room sizes as the rooms were more crowded and this resulted in low comfort and privacy levels for the occupants. The crowding of these rooms has also robbed the occupants of adequate personal space which has resulted in a high level of territorial behaviour as can be seen from the findings. However, on a general note from the findings, it was discovered that both sample populations expressed great dissatisfaction with the spatial design of the rooms as well as the physical condition of the rooms and also intrusion into their private spaces. The findings from the study showed that

satisfaction in the interior space will go a long way in ensuring positive human behaviour as well as fostering healthy social interaction among the residents of the sampled bungalows.

CONCLUSION

As has been seen from the findings of the survey, the residents of the Residential units of the Old Legislative Quarters differ in behaviour because of their varied perceptions of their interior spatial environments. It has also been seen that not all of these behaviour traits are positive; hence, if the measures suggested above are put in place, it will go a long way in eliciting positive behavioural traits in the residents living in the bungalows as well as increase satisfaction with living conditions, thereby encouraging positive spatial perception through effective spatial design done with due consideration of the users of the space as well as the provision of adequate storage space as well as ventilation and avoiding the over allocation of rooms which gives room for crowding and lack for privacy of the occupants of the spaces.

RECOMMENDATIONS

In order for the residential units to elicit positive human behaviour as facilitated by spatial perception, which will ensure maximal satisfaction as well as healthy social interaction among the residents living in the bungalows, great consideration has to be given by both the Architects and relevant Housing Providers to user satisfaction in residential buildings. Long lasting solutions can be produced by taking the following measures into cognisance:

- a. Architects should design with the users in mind, not just for the users. This means that spaces should not be designed without careful consideration to the occupants of the spaces and their needs.
- b. The Housing Authorities should provide for the construction of more affordable housing to eradicate crowding in housing estates, to ensure a higher level of satisfaction to the occupants.
- c. Care should be taken by the designers to provide enough room for storage and adequate ventilation in the spatial design.

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