A Simulation Framework for Housing Choice Optimality: Decision-Support Guide for Housing Procurement Service in Abuja

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Abstract

Currently, an assessment index to guide Estate Surveyors and Valuers (ESV), willing to offer housing procurement service for house-seekers does not exist. Concomitantly, house-seekers in Abuja, because of their limited capacities to gather and process contemporary housing market data, are in need of advice from ESV. This technical constraint explains why the levels and variations in Housing Choice Optimality, (HcO**)**, in Abuja are unrevealed. The aim of this paper is to develop an Optimality Index,(OPTi), a simulation framework to assess HcO, and test its application from two perspectives based on utility optimization of 5 key variables, namely, household income, property value, workplace distance, commuting cost and activity pattern. Data from 12 randomly selected ESV firms, 56 households extracted from a larger set of 182 Middle Income Households, (MIH), on the basis of carefully selected criteria, and 1 median income Household were purposefully chosen as illustration, to demonstrate the application of OPTi to assess HcO**.** It was revealed that indeed there are wide variations in HcO across households in the 6 neighborhoods studied, ranging from 0.9044, 0.6612, 0.3424, -7.184, -0.7774, to -11.703. These results seem to confirm that a wide level of housing inequality exists even among households in Abuja, and in some neighborhoods the levels are unacceptably low. The consistency of the results with well known pattern in Abuja housing market is a proof that the simulation package could assess housing wellbeing objectively. It is recommended that OPTi could be used by ESV to assess housing conditions from utility perspective as it is more inclusive than cost-based affordability indices.

Keywords: Housing Choice Optimality, Decision-support, Property value, Simulation, Housing Well-being.

Introduction

Technical and regulatory constraints are two main obstacles to the assessment of housing-specific wellbeing, designated in this research as housing choice optimality (HcO) among Abuja urbanites. Emphasis in this study rests on the development of a utility-based technique to assess HcO as a Decision-Support system for ESVs who may wish to offer Residential Accommodation Procurement services (RAPs). It is a specialized and upgraded form of agency services which Estate Surveyors and Valuers (ESVs) are positioned to offer. Many ESVs offer residential agency services strictly on the basis of affordability, rather than tenants' housing well-being.

In spite of the opportunity that abounds for the ESV in RAPs services, anecdotal evidence suggests that a void in service coverage still exists to serve the household more purposefully as a tenant. This void constitutes, and translates to, a gap in knowledge which, as emphasized by Maritz and Ghyoot (1990), requires specialized training and education. Going back to the history of Estate Management, Thorncroft (1965) in his definition places emphasis on the supervision of real estate interests to secure optimum returns and social benefits for any holder of an interest in property. However, the mechanism by which optimality could be measured objectively is still missing in real estate practice.

The aim of this research is to develop a simulation framework to assess housing choice optimality, HcO, and test its application from two perspectives: households and neighborhoods. Three objectives set up to achieve this aim are to develop a simulation Technique for assessing Housing Choice Optimality, HcO levels and variations and test the application of the technique to assess HcO for the Median Income Household in a selected population of Abuja, as an illustration. Thirdly, the simulation package is to be applied in a wider context, to assess the HcO variations among 6 selected Medium density neighborhoods.

Housing has been confirmed as a major issue in urban Nigeria, and, Abuja as a political and commercial center, has witnessed unprecedented in-migration and outmigration in recent times. However, Abuja is now widely recognized as a maturing and emerging global property market and it presents a suitable test-bed for an examination of peoples' welfare attributable to housing choices.

Nigeria, alongside 42 other emerging property markets, is classified as a Low Transparency Market (LTM) by Global Real Estate Transparency Index [GRETI] (2016). This is just 1 step above an Opaque Market, but 3 steps below a Highly Transparent Market. GRETI concluded that transparent real estate practices have direct correlation with efforts to raise community well-being in LTMs. The main features of LTM which are reminiscent of Abuja are low levels of "security of property rights ownership, safe housing and workplaces and being able to trust estate agents to act honestly and professionally". In the absence of appropriate indexation of housing well-being in Abuja, it is doubtful if real estate transparency practices could be guaranteed.

The main research question posed by this study is consolidated into the levels of optimality in residential choice decisions made by households in the study area.

It is assumed, for the purpose of this study, that work or gainful employment is an important economic activity of the urban MIHs and that MIHs are rational and tend to seek after optimality when compelled to make residential choices. Although a previous study by Limbumba (2007) affirms this tendency for Dar es Salam, it remains only an assumption in Abuja since there is no corresponding empirical study.. It is also presumed that variables which are measurable on scale ratio are reliable indicators of housing choice optimality.

The study scope covers residential choice decisions by middle-income households in an urban setting. Studies have shown that MIHs are found in nearly all neighborhoods as owner-occupiers or tenants, but are predominant in certain districts that are purposively identified in the study area. Spatial data through empirical observations including physical measurements were primarily relied upon; this imposes considerable limitation on the sample size for the study, but the methodology adopted ensures validity of results.

The need for an indicator to assess any human condition susceptible to wide variations such as housing choice is undeniable. This is explained by multiplicity of affordability indicators, most of which are cost-based. The importance of Optimality is borne out of the absence of an objective gauge to measure well-being attributable to housing (Limbumba, 2007). A lot of criticisms have trailed the continued use of variants of affordability index as a measure of housing conditions principally because it is cost-based. To compound the problem, the technical capacity of the house seeker to gather and process property market data is severely limited thus require an advisor. This limitation justifies the development of a Decision-Support guide for the ESVs, as a real estate advisor, to assist the house seeker professionally. Ultimately, the ESVs using this guide would have an enhanced capacity to serve the general public beyond mere agency service because Optimality index is utility-based and a more inclusive indicator of housing well-being.

Literature and Theoretical Review

Theoretical Underpinnings for Utility Concept and Optimality in relation to housing

A strong theoretical base is needed to address the measurability or evaluability aspects of housing well-being. The theoretical underpinning is provided by the utility concept. Utility Functions which convert all arguments of residential choice to a measurable unit, in a clearer form, seem to rectify the shortcomings about measurement of Housing well-being, HWB. It is supported by Straszheim (1975), Granfield (1975) and Cappoza and Helsley (1989) to model residential location choice. The Cobb-Douglas version of the utility function was adopted with modifications by Bolton (2005) and Pollakowski *et al*. (2007). However, Bolton's version seems to have more demonstrable application and capabilities, using ICT. Though unsuitable in its present form for a number of reasons (for example the nature and composition of variables adopted), it lends itself to adaptations and is amenable to modifications and technical transformation.

Barlowe (1986) stresses the combined importance of the utility, scarcity and futurity. Going further than Barlow, the Appraisal Institute (2001) defines utility as the ability of a product (such as housing) to satisfy a human want; all property must confer utility on households (tenants, owner investors or owner occupiers). Utility, scarcity and effective purchasing power, are the four economic factors that create property value. The Institute draws distinction between the design features that enhance attractiveness (amenities) and utility. The influence of utility depends on the characteristics of the property such as size utility, design utility, location utility and other specific forms of utility.

Emphasis is also placed on functional utility, defined by Appraisal Institute (2001) as the ability of a property to be useful and to perform the functions for which it is intended; the efficiency of buildings in terms of architectural style, layout, (traffic pattern or circulation pattern), size and type of rooms. Optimal functional utility implies that a building is considered best to meet the expectations of the users. In their opinion, the marketability or rental value is the ultimate test of optimal functional utility. Other standards of functional utility are design/layout, amenity, comfort level, ease and cost of maintenance, space, safety and security.

Bid-rent theory

Households, in a bid to maximize utility, have to compete for urban space, with other users. The development of this proposition is attributed, in Knox and McCarthy (2005), to Alonso (1964a). First, household will find central locations and employment nodes most attractive and desirable and will be prepared to bid highest rent for the right to be nearest. The reasons are two-fold: central locations offer the highest utility and the best opportunity to earn the highest income; then the commuting cost to work node is less than elsewhere. Secondly, each class of household as argued by O'Sullivan (2000) will have a distinct bid-rent curve that reflects its capacity to pay rent for locations at varying distances from the

Central Bussiness District (CBD). These benefits accruing to a household are interpreted as Utility for which the household, in competition with others, is compelled to pay a rent. Alonso found out that the bid-rent declines from the center to the periphery at a rate that partially reflects the quality and costs of urban transportation system as presented in equations IV and V. Also, Olatubara (1994) argued that activity pattern which represents the nodes regularly patronized by the household is an important factor.

Location Theory

Location theories are concerned with the allocation and use of land resource, and how land uses compete for the limited urban and regional space. The theory of urban land use is traced to Ricardo, the 19th century classical economist who stated that among other things the location of a piece of land determines its use and its rent (Aluko, 2004).

From the reviewed authorities, five major factors that seem to have dominant effect on residential choice are property attributes, neighborhood characteristics, activity pattern, socio-economic variables and other non-housing factors. From this broad grouping, the key variables identified by Olatunji (2012) are extracted for optimality test on the basis of their measurable attributes: space for land (L) and improvement (H), property value, commuting cost(C) and workplace distance (D) and household income(Y).

Utility Function

The utility function combines all the aforementioned key variables or determinants in a way that brings out a solution for decision making. In Bolton (2005), three sets of functions are developed based on modified Cobb-Douglas utility version. Olatunji (2010, 2012) present an adaptation of this utility functions with clear transformations in Equation I.

The Key Variables

The key variables revealed in the literature and theoretical reviews are six**.** *Property Value* represents the rental value of the apartment of choice. It is obtained by disaggregating and adjusting the self-declared contract rent for errors emanating from property quality, land space, house space, land price and house price. *Household Income* is the monthly gross income upon which the household has full and effective control. The total distance attributed to movements of house members to all the various activity nodes patronized on a monthly basis is the *Network Linkage* or *Activity Pattern***,** while the cost implication in terms of out-of-pocket expenses is the *Commuting Cost***.** All other articles, goods and services upon which the household spends the entire remainder of its income after meeting the rental and commuting costs are classified as *Non-housing variable.*

Methodology

Primary data obtained from 182 households in the study areas were employed. Through questionnaires, data pertaining to the socio-economic status of the household and the commuting costs per month were obtained. Data on physical spaces (house sizes and plot sizes), were obtained partly through physical tape-survey and from ESVs. The property values profile of the area was obtained from the ESVs. The network linkages of activity patterns engaged in by each household and its members were established in terms of distances in kilometers, their spatial pattern of house and workplace locational geo-references were established using handheld GPS in conjunction with Google Maps online application.

The study area was first stratified by neighborhood densities and then the medium density neighborhoods where MIHs are predominant were purposively chosen. Identification was based on advice and assistance of Abuja Geographic Information System (AGIS). In Abuja, Utako, Durumi, Wuye and are 4 of 11 districts with features matching medium density. MIH are selected randomly therefrom. There are 107 estate firms in Abuja, listed in the 2014 directory of Nigerian Institution of Estate Surveyors and Valuers, NIESV and 10 were selected with systematic randomness from the directory of practicing firms.

The respondent household with five options, as revealed in its questionnaire indicated the highest number of choices, and was selected to illustrate the Housing Choice Optimality simulation. The list of 56 households (representing 30.77% of the population of MIH in the study area), whose questionnaires disclosed complete spatial data on four key decision variables (household income, property value constituents, commuting cost and network distances) was extracted from the 182 households surveyed by Olatunji (2014) and used for the Optimality Simulation programme.

Data Presentation

Table 1 presents the optimality decision variables in 14 rows and 7 columns. The columns designated 1- 5 on top are the house options available to the household to chose from. The income row shows the entire family income which is constant for all. The 2nd and 3rd rows are the plot and house sizes respectively, presented both in hectares and square metres, with measured data capturing instrument. Land rent is the amount of rent attributed to bare land. It is derived, as a residual, by apportionment as indicated in Royal Institution of Chartered Surveyors, 2014 Guidance Notes.

Table.1 Housing Choice Optimality Data for Five Options available to the Median Income earner

	Variables		**House Choices**				
1	**Variable Name**	**Notation/ Unit**	**1**	**2**	**3**	**4**	**5**
2	Income	₦/m p.a.	510000	510000	510000	510000	510000
3	Plot size	Ha; (m^2)	0.0136; (136)	0.0625; (625)	0.0537; (537)	0.06; (600)	0.043 (428)
4	House size	Ha; (m^2)	0.0158; (158)	0.0171; (171)	0.0134; (134)	0.024; (240)	0.0001; (114)
5	Rental Value	₦/mth; (₦ p.a.)	120000; (1440000)	200000; (2400000)	143,750; (1725000)	208,333 (2500000)	200000 (2400000)
6	Land rent*	₦/m^2/mth; ₦/ m^2p.a	143.48; 1723	111.83; 1342	98.5; 1182	335.42; 4025	357.83 4294
7	House rent**	₦/m^2/mth; ₦/ m^2p.a	7630.8; 635.9	9130; 760.84	8136; 678.03	354.17; 29.51	4931; 354.17
8	House value	₦ / ha/mth	6359030	7608430	6780261	295139	4109415
9	Land Value	₦ /ha/mth	1435833	1118333	985000	3354167	3578333
10	Commuting Cost	₦/mth	31000	39000	38000	34000	30000
11	Activity Pattern	Km/mth	120	192	264	288	252
12	Location	Km	5.25	9.9	10.35	6.0	6.1
13	Utility	-	8925	2354	-4957	719	3165
14	Optimality	-	0.561	0.166	-0.6468	0.6318	0.303

Development of Simulation Framework

To attain a certain desired level of residential fulfillment, a household, **i**, expends all its monthly income, **Yi,** on a particular house choice **c** plus other essential needs, E, as follows:

$$Y_i = AL_{jc}P_{Ljc} + EP_{Ejc} + H_{jc}P_{Hjc} + C_{wc} \quad \ldots\ldots\ldots I$$

Where, L , H, E represent land, house and non-housing good respectively, and P**L**, P**H**, P**E** represent their respective prices; A is a constant.

After expending all household income,

Yi = Xi, where Xi is total monthly Expenditure ……….II

A level of utility is attained, thus,

$$U_{ijc} = A \,.\, Ljc^{\alpha} \,.\, Ejc^{\beta} \,.\, Hjc^{\theta} - gD^{\gamma} \quad \ldots\ldots\ldots III$$

Where

Uijc represents the welfare level experienced by household **i** at location **j** from house choice **c**; Ljc is the plot size of location j; Ejc is the size of the non-housing goods; H**jc** is the size of the house chosen; and D is the network linkage of activity pattern engaged in. The parameters, α, β, θ, are defined as proportionate returns to scale on each of the three variables, L, H and E.., defined in Equation I

Prices are specified for each of the variables as follows:

$$P_{Lj} = P_w \exp(\delta) D_{wc} + N \quad \ldots\ldots\ldots IV$$

Where P_{Lj} is the bid-rent or Price per hectare of the plot located at j ,

P_W is the rack-rent or price per ha of workplace location, **w** by household **i**);

D_{wc} is distance between workplace (**w**) and house chosen(**c**); and **N** is the market value of the neighbourhood quality of location **j**;

P**Ejc** the unit price of essential pack is 1; and P_0 is a special price representing the rack rent.

The commutting cost function is specified, thus:

$$C = vD_{wc}^{\eta} \quad \ldots\ldots\ldots V$$

P_E, the combined price of all the non-housing needs is designated as 1 unit.

The magnitudes or sizes of the variables, Land (L), House (H) and Non-housing good (E), are derived from Marshalian demand functions respectively in Equations VI, VII and VIII thus:

$$L^* = \left[\frac{\alpha}{(\alpha + \beta + \theta)}\right] \frac{M}{PL} \quad \ldots\ldots\ldots VI$$

$$H^* = \left[\frac{\theta}{(\alpha + \beta + \theta)}\right] \frac{M}{P_H} \quad \ldots\ldots\ldots VII$$

$$E^* = \left[\frac{\beta}{(\alpha + \beta + \theta)}\right] \frac{M}{P_E} \quad VIII$$

where **M is Y-C,** and other parameters are as previously defined.

The Optimality Index, OPTi

The index is construed as the level of optimality that the household under observation stands to obtain from the given house choice. It also has the ability to measure the true Location efficiency of a particular house choice to a particular household. The Utility obtained, U_{ijc}, represents the satisfaction level achieved as indicated by the examination. It is the figure of utility in Column S that corresponds to the location D, of the house choice, Revealed or Stated.

The Utility obtainable, **Uiw** represents the highest satisfaction possible for the household under analysis, given the combination of factors, variables and parameters that exercise control over the household choice. It is the highest figure of

Utility, and it is usually, but not always, found at D=0 or close to D=0.

The Optimality Index , OPTi, is derived from the simple relationship:

OPTi = (Utility Obtained)/(Utility Obtainable)

$OPTi = U_{ijc}/Uiw$ IX

Where**,**
OPTi is the level of fulfilment, contentment or satisfaction that a particular household **i** whose primary workplace is **w**, stands to achieve from a particular house choice **c** in neighbourhood **j**,
$\mathbf{U_{ijc}}$ is the Utility obtained by household **i** from house choice **c** at neighbourhood j,
Uiw is the highest possible utility obtainable by household **i** from house choice **c** at workplace **w** or at any other location for that matter.

At the zenith of any choice, $\mathbf{U_{ijc}}$ will equate U**iw**. This implies that the maximum **OPT**i is unity, 1. Under extremely adverse conditions utility obtained or obtainable could be negative, and then OPTi could be negative. The optimal choice is indicated by OPTi = 1; any values less than 1 can be construed or interpreted as sub-optimal choices. The three theoretical optimization conditions, if passed, are merely to reinforce the OPTi.

As OPTi is tied to utility, two facts are worthy of note; OPTi has no units and its relative figures are useful for comparing the HWB of two or more house choices in rank, bearing in mind that the highest figure is 1. In absolute terms, OPTi has the capacity to show by how much the HWB of one choice exceeds or falls below the other. This is a good Decision-Support attribute of the model.

Computer Simulation Programme
Based on these functions a computer programme is developed to simulate the choices made by the selected households in Abuja. This is illustrated in thirteen steps that lead the household from preference to choice demonstrated in Excel Spreadsheets and Worksheets.

Step1: In an Excel Worksheet, all the parameters for Abuja are preset at defaults as follows:
α=0.1; β= 1.1 ; θ = 0.3 ; η=0.75; v=7969.87; g= 337.897; δ= -0.85
γ= 1.75;Po=1000000; Y=0; D=0

In Excel Spreadsheet, the parameters are entered in Columns B through to Column K.
*Step 2***:** Impute Y, Household Income (In Column A)
Step 3: Impute D, Workplace distance (In Column L)
Step 4: Impute PH, House value directly (In Column P)
Step 5: Impute PL, Land value, actual using the PL function and N, the add-on, that produce actual land price. (In Column Q)
Step 6: Impute H, house size, actual by adjusting θ from preset position by iteration
Step 7: Impute L, plot size, actual by adjusting α from preset position also by iteration. Observe and record the utility.
Step 8 : Generate U values for locations D=0, 1, 2….. to D=11km across the city. Scan all values of U and observe U* maximum, usually at D=0 or nearby.
Step 9: Set OPTi level in Column S
Step 10 : Observe OPTi at location D
Step 11: Repeat steps 2 to 10 for each available house choice.
Step 12: Observe and compare OPTi indices for all available house options
Step 13: Select House option corresponding to the highest OPTi

The Simulation Narrative: how the simulation process runs

Compelled by need, an accommodation seeker usually enlists friends, co-workers, relations as well as professional estate agents to find a house matching the need in terms of size, location, rent and other pertinent variables of housing, all of which are consolidated into HcO. From these sources a finite set is generated. If consulted, the ESV extracts only six variables from each of the options presented by the accommodation seeker, represented in Plate 1. These are fed into the simulation programme, starting with Step 2. For security, the programme is passworded and opens a dialogue box when the password is imputed. The house choices are assessed consecutively, until the OPTi in each case is arrived at in Step 21. The limitation here is that the choice set must be finite as the programme is not designed to handle unlimited choice sets.

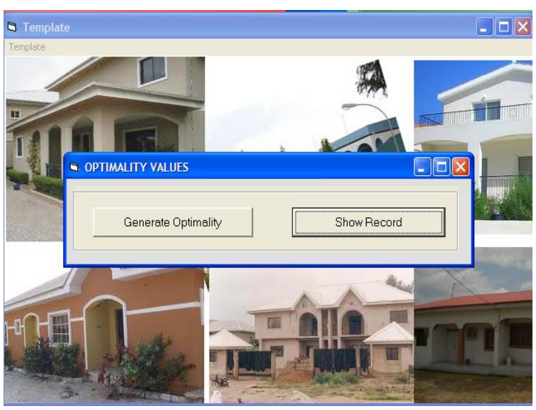

Plate1: Dialogue box to generate Optimality index and show the record

On the Simulation Programme:

The Simulation Programme is based on Visual Basics programming language with Microsoft Access database and is run through 21 steps as follows:

Step 1. **Click on** Here to continue

Step 2. **Login:** User Name; Password

Step 3. **Click on** Template

Step 4. **Select** select template

Step 5. **Select** Abuja or Minna

Step 6. **Click on** Show the Template's variable Inputs

Step 7. **Input** **α, β, θ**

Step 8. **Click on** Activate

Step 9. **Input Y** = and **Click on** Activate

Step 10.**Input D** = **Click on** Activate

Step 11.**Input PH= Click on** Activate

Step 12. **Click on** Calculate PL to open a Dialogue box

Input PL Present =

Click on Calculate (delete –ve signs in dialogue box)

Click on Close

Step 13. **Click on** Activate

Step 14. **Click on** Calculate to calculate H; then Activate

Step 15. **Click on** Calculate to calculate L; then Activate

Step 16. **Click on** Generate Utility

Step 17. **Click on OK** in Project 1 dialogue box

Step 18. **Click on** Proceed to generate Optimality Values

Step 19. **Click on** Generate Optimality

Step 20. **Click on** OK in Project 1 dialogue box, Optimality generated

Step 21. **Click on** Show Record

Observe the value of OPTi corresponding to D, and record.

Application of Framework to Assess the HcO for the Median Income Household

The median income for the population of study was found to be N510,000, attributed to a particular household; other details specific to the household are shown in Table 2 and are used alongside income as the variables for the simulation exercise.

Table 2: Field Data for Median Income-Earning Household

D	C	Y	L	H	Pl	Ph	Rent P.M.	Nd	Opti
5.25	31000	510000	0.0136	0.0158	1435833	6359030	120000.	120	0.6505

KEYS: OPTi= Optimality Index; Y= Income in Naira per month; D=Distance in km; PH= House price in Naira per ha per month; PL= Price attributed to neighbourhood quality in Naira per ha per month; H=House size in ha; L= Plot size in ha; C= Commuting Cost in Naira per month; ND=Network Commuting in kilometers

The values of α, β, θ are 0.04607, 0.8547, 0.237. When imputed with relevant data obtained from the housing market shown in Table 2 and run in the simulation programme, they produce the output in Table 3.

The annual rental of N1446101 returned by the Simulation programme in Table 2 constitutes a good pedagogical check against the actual rental value of N1,440,000 per annum respectively obtained from the property market. Minor difference is attributable to serial approximations.

Table 3 shows the profile of residential choice utility optimisation for the Median income household in Abuja over a span of 12 kilometers radius from Durumi I. Durumi I , where the household lives is identified by georeferenced coordinates 9.025004N; 7.465576E and UTM readings 997978.7N; 331342.0E. The household head workplace is located 5.25 kilometers away and has UTM georeferences of 1001056.909 Northing and 333539.546 Easting. Furthermore, the household activity network, ND, amounts to 120 kilometers per month which is below the neighbourhood mean of 205 kilometers.

The Table also shows comparative results of two housing indices: that Affordability (24%) and H+T (29%) place this particular household on a better affordability level than the benchmarks of 30% and 45% respectively. Ostensibly, this implies that the household is well off in term of affordable cost burden. However, the OPTi level of 0.6505 portrays more accurately, the level of well-being achieved by the household as sub-optimal in term of utility achieved. The interpretation of this index is undertaken in Tables 4 and 5.

Table 3: Utility Optimisation Output from Simulation Programme for Abuja

***Y	D	Utility	MCD	MMUD	Affor1	H+T	Rent p.a.	OPTi
510000	0	17054	0	0	0.25	0.25	1539545	1
510000	1	16626	-12,507	-12,317	0.25	0.26	1515486	0.9952
510000	2	15730	-13,258	-20,735	0.24	0.27	1499083	0.9604
510000	3	14423	-13,568	-28,128	0.24	0.28	1484703	0.8947
510000	4	12765	-13,722	-34,930	0.24	0.28	1471496	0.8002
510000	5	10790	-13,800	-41,324	0.24	0.29	1459100	0.6807
510000	5.25	10249	-13,812	-42,872	0.24	0.29	1446101	0.6505
510000	6	8520	-13,834	-47,413	0.24	0.3	1447312	0.5621
510000	7	5970	-13,841	-53,262	0.23	0.3	1436008	0.4245
510000	8	3152	-13,828	-58,912	0.23	0.31	1425101	0.2527
510000	9	74	-13,802	-64,395	0.23	0.31	1414532	0.0117
510000	10	-3256	-13,767	-69,735	0.23	0.32	1404252	-0.3125
510000	11	-6833	-13,724	-74,950	0.23	0.32	1394227	-0.7933
510000	12	-10650	-13,675	-80,055	0.23	0.33	1384428	-1.7623

***All notations are as previously define**d**

The negative values of both MMUD and MCD are a check or proof that the settings are theoretically in order.

Application of Simulation Framework to assess HcO in Selected Neighbourhoods.
The levels of WBH are designated by optimality levels and measured by OPTi index, a Utility-based indicator, and a proxy that consolidates the key house choice variables. The results of Optimality variations using the OPTi index are presented in Table 4 and they confirm that there is indeed a wide variation across households, neighbourhoods and even between the study areas.

The range of values of OPTi indices among individual households was computed in line with the simulation framework of this study; this is interpreted in Table 5. Three of the six neighbourhoods in Abuja (Utako, Abacha and FinanceQ in Table 4) with favourable indicators on the H+T and AFF indices are observed to have poor housing choice optimality standards.

Main Contributions to Knowledge
The paper contributes to knowledge by developing a Decision–Support System for measuring housing-specific well-being, HcO, as an assistive tool for Estate Surveyors and Valuers in practice of Residential Accommodation Procurement counselling service to house seekers on demand. Also, it enables the ESV to ascertaining the levels of optimality or household-specific well-being of a neighbourhood and a contemplated house choice. All of these hold some prospects in policy formulation towards Housing Care and Support for the well-being of the family in the study area.

Table 4:Comparative Schedule of Optimality and other Housing Indices across 6 selected Neighbourhoods in Abuja

	AFF Index(%)	H+T (%)	OPTi
Sagamio	14.12	18.74	0.6612
Okekenta	16.23	21.60	0.9044
Estate4	26.88	32.29	0.3424
Utako	22.97	26.81	-0.7774
I. Abacha	37.74	41.44	-11.703
Finance Q	28.91	36.20	-7.184
Study Area	14.87	20.39	-2.959

Source: Fieldwork, 2016

Table 5 Interpretation of Residential Choice Decisions on Optimality Index Scale

OPTi indexLevel	Description of Choice Decision	Optimality Interpretation
1	Excellent	Optimal
≥ 0.80	Very Good	Sub-optimal
≥0.60	Good	Sub-optimal
≥0.50	Moderate	Sub-optimal
≥0.20	Poor	Sub-optimal
≥0.00	Very poor	Sub-optimal
≤ 0.00		Non-optimal

Source: Fieldwork**, 2016**

Findings
The results emanating from the simulation programme seem to confirm the existing belief that there are wide variations and inequalities in housing conditions in urban Nigeria. The limitations in technical capacities of house seekers to gather and process property market data provide an imperative and justification for developing an assistive technique or decision-support system. To this end, the Simulation Framework developed appears to offer predictive capability to assess Housing Choice Optimality.

Conclusion and Recommendation
Housing delivery policies by the Federal and State Governments in Nigeria, particularly in FCT and neighboring Niger State, if correctly interpreted, are steps towards creating wider house choice sets for

Nigerians and to improve their well-beings associated with housing. The study uses revealed residential choice and measurable variables to model well-being attributable to housing choices among households and neighborhoods in the study area. The results of the simulation are largely consistent with the well-known pattern of well-being, which portrays wide inequalities in housing perceptions among a fairly homogeneous group of Middle Income Households; the OPTi enjoys an advantage drawn from its quantitative and objective attributes.

In the business world, the indices issued from time to time by Rating Agencies such as Moody, Fitch and Standard and Poors on the economic performances of Financial Institutions, Corporations and the national economies are very useful decision-support guides for decision makers. In the same vein, the degree of precision in this framework could point to its usefulness as a predictive and objective decision-support guide to empower Estate Surveyors and Valuers in advising their clients on Housing Choice Optimality. It is thus recommended that ESVs using this package would be able to offer Residential Accommodation Procurement services to their clients based on optimal choices.

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