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Evaluating Neighborhoods Livability in Nigeria: A Structural Equation Modelling (SEM) Approach

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ABSTRACT

There is a growing concern about city livability around the world and of particular concern is the aspects of the person-environment relationship which encompasses many characteristics suffice to make a place livable. Extant literature provides livability dimensions such as housing unit characteristics, neighborhood facilities, economic vitality and safety environment. These livability dimensions as well as their attributes found in the extant literature have been reported to have high reliability measurement level. Although, various methods have been applied to examine relationships among the variables however structural equation modeling (SEM) has been found more holistic as a modeling technique to understand and explain the relationships that may exist among variable measurements. Structural equation modeling simultaneously performs multivariate analysis including multiple regression, path and factor analysis in the cause-effect relationships between latent constructs. Therefore, this study investigates the key factors of livability of planned residential neighborhoods in Minna, Nigeria with the research objectives of – (a) to study the livability level of the selected residential neighborhoods, (b) to determine the dimensions and indicators which most influence the level of livability in the selected residential neighborhoods, and (c) to reliably test the efficacy of structural equation modeling (SEM) in the assessment of livability. The methodology adopted in this study includes- Data collection with the aid of structured questionnaire survey administered to the residents of the study area based on stratified random sampling. The data collected was analyzed with the aid of the Statistical Package for Social Sciences (SPSS) 22.0 and AMOS 22.0 software for structural equation modeling (a second-order factor). The study revealed that livability as a second-order factor is indicated by economic vitality, safety environment, neighborhood facilities and housing unit characteristics first-order factors. The result shows that economic vitality (income, mobility and mobility cost) most significantly measures neighborhood livability. Also, results of the model achieved good fit indices such as CFI of 0.907 and the RMSEA value of 0.096. Thus, SEM analyses in this study offer a methodological guide on the efficacy of CFA second-order factor.

1. Introduction

Rapid growing of cities and other built-up areas became point of concern for the planners in the 80's, which brought into fore the livability concept (VanZerr and Seskin, 2011). Since then, livability is being debated both in the academic and policy decision making forum and yet standardization of the concept of livability is still exploratory (Van den Heuvel, 2013). Studies on the livability of cities have been on the increase due to their perceived aftermath significant contributions to the quality of life (QOL). Although the quality of life (QOL) has been studied from different disciplines, however, it does not mean absence of diseases or sickness rather QOL depends largely on the living environment that encompasses both the built and natural environment (Sule and Mohit, 2015). Also, Livability and Sustainability are distinct concepts, although there is substantial overlap, and they may be occasionally used interchangeably. Both notions are multifaceted, dynamic, flexible, and powerful (Sanford, 2013). Lowe, et al., (2013) describes livability as bedrock to sustainability plan and results in an overall better quality of life (Abdelbaset, 2015).

The term 'livability' as urban planning concept emerged as a philosophy for proactive planning/management of the built environment in the 1970s when the America academics and planners were confronted with the effects of urban sprawl such as social alienation and a loss of sense of community. The work of Kevin Lynch and Jane Jacob in the 60s with the observation of the physical characteristics of a city's built environment in America shows that urban environments should be designed for people, with walkable streets, friendly public places, and lively neighbourhoods, their work contributed to the development of the concept of livability. While the Lynch's study (1960) emphasized on the layout of city to include network of paths, nodes and landmarks, Jacob (1961) on the other hand emphasized on the need to develop mixed-use neighbourhood that give life to busy streets as empty streets are dangerous and warn against single-purpose zoning (Abd El-Fattah, 2011). Sanoff and Sawhney (1972) in their study of the town of Asheboro, North Carolina identified dwelling and neighbourhood features as the key factors that contribute to residential environment livability satisfaction of the low-income families housing. The previous researchers posit diverse dimensions but common factors to explore the livability of the living environment namely housing/dwelling unit features (Omuta, 1988; Heylen, 2006; Li, 2012; Namazi-Rad et al., 2012; Buys et al; 2013), physical/neighbourhood conditions (Balsas, 2004; Chaudhury, 2005; Heylen, 2006; Leby and Hashim, 2010; Asiyanbola et al., 2012), economic vitality or development (Balsas, 2004; Song, 2011; Saitluanga, 2013), safety (Leby and Hashim, 2010; Asiyanbola et al., 2012; Lawanson et al., 2013) and social interaction (Pandey et al., 2014a; Leby and Hashim, 2010; Saitluanga, 2013). These dimensions of measuring livability were reported to have high internal reliability index (i.e. Cronbach alpha value) above 0.07 (Leby and Hashim, 2010). Although previous studies have substantially identified the dimensions of livability; however the previous studies have not substantially estimated causal relationships between latent constructs. In this study, those dimensions were assessed using Structural Equation Modelling (SEM). Application of SEM helps to determine what factors underlie a set of indicators and investigates the strength of the relationship between theoretical constructs (Memon et al., 2012; Tomarken and Waller, 2005; Barbara, 2010). The SEM consists of measurement and structural models, the former measured the relationships between each latent variable and the corresponding manifest variables and the latter shows the relationships among the latent variables. According to Memon et al., (2012) SEM analysis approach includes covariance-based structure analysis (CB-SEM) and component-based analysis using partial least square (PLS-SEM). This study therefore investigates the key factors of livability of planned residential neighbourhoods in Minna, Nigeria using CB-SEM.

2. Theoretical Background

The concept of livability stands for the interaction between the community and the environment (Safer et al., 2000). How well a city works for its inhabitants is the central focus of livability. The inhabitants of cities need services for their well-being; this naturally brings about the concept of liveable city. The extant literature neither provide a unified definition of livability/liveable city nor present a standardize measurement of it. The Centre for Liveable Cities (2011) refers to livability as the city with excellent planning that creates lively, an attractive and secure environment for the inhabitants to live, work and play. It has good governance, a competitive economy, high quality of life and sustainable environment. Thus, it is an urban system that contributes to the physical and social well being as well as personal development of all inhabitants (Song, 2011). Economic Intelligent Unit (2012) described livability as one of the determinants of quality of life. Shuhana et al., (2012) opined that high quality of living will affect citizen's lifestyle, health condition and shows stability of the built environment. Van Dorst (2012) described livability as the equilibrium between people and the built environment. His opinion suggests an ideal environment where the residents maintained outdoor spaces collectively. Livability according to Castellati (1997) means experiencing oneself as a real person in the City. Similarly, Southworth (2007) consider it as determinant of how well the City works for its inhabitants. The fundamental characteristics of a liveable city should include the followings as espoused in 1997 by Lennard (Timmer and Seymoar, 2006). These include; An attractive, pedestrian-oriented public realm, low traffic speed, volume, and congestion, affordable and decent housing, access to schools, shops, and other services, accessible parks and open space, places that blend the built environment and natural environment, diverse, legible, and educative built landscapes, safety of all inhabitants, keeping cultural heritage, history, and ecology, and human community and interaction.

On another perspective scale, countries of the world perceive livability differently, such as United State (US) where livability refers to the overall ' quality of life' and 'well-being', whereas in the United Kingdom (UK) livability center of attention is strictly on local environment e.g. cleanliness, safety and greenery (Pandey et al., 2014b; Woolcock, 2010). However, the relativity of the term livability gave the impression that the actual meaning depends on the place, time and purpose of the assessment, and on the value system of the assessor (Pacione, 2003). The microeconomics activities of a city have profound implication on the quality of life and thus, on the city livability. The city of Sai Ying Pun found to have better quality of life compared to the city of Tin Shui Wai in Hong Kong due to vibrant microeconomic activities in the city (Bouffard et al., 2013). Similarly, economic growth of the city of Dhaka has made it more liveable than the city of Khulna in Bangladesh (Chaudhury, 2005).

A study conducted in China shows that a well developing economic system has positive influence on a city's livability (Song, 2011). Ozo (1990) measured the livability of core housing projects in Benin City, the then headquarters of Bendel State of Nigeria. The survey design study used an interview schedule through a systematic sampling technique to select one-fifth of household heads in the core housing of 900 units, the results of the study reveal that over sixty per cent of the respondents were dissatisfied with general housing estate experience. The aspect with which less than 40% of the residents were satisfied relates to security, neighbour relations, home ownership policy of the government and the housing payment arrangement. Conversely, the residents were dissatisfied with the number of bedrooms in their acquired housing units, less privacy (because of semi-detached character of the building), kitchen (space and location). Also, they are dissatisfied with public transportation, children's schools, medical facilities, poor roads and drainage system in the estate. The coaster city area of Ho Chi Minh City South East Asia vulnerability to flood risk and climate change was revealed in the livability study conducted by Eckert and Schinkel (2009). The disaster of flood is identified as causes of water pollution, epidemic diseases, damaging house infrastructure and destroying sources of livelihood of the area (crops and plants destruction).

The effect of climate change on the living environment has not been taken into cognizance in many urban planning. Cities in the South of Vietnam are said to be experiencing warm, hot and humid climate throughout the year. The neglect of climate change issues in the formally planned housing construction, especially in Ho Chi Minh City posed threat to life. The study advocates for adaptation of measures in the like "urban flooding" and "urban climate". These should be tackled on conurbation, neighbourhood and building levels while the urban climate change requires green spaces, green infrastructure etc. The livability assessment of the New Towns developed by State Economic Development Corporations in Malaysia was carried out by Dasimah (2009).

The study investigates community facilities (e.g. Primary and secondary schools, place of worships and entertainment centers), shopping facilities (available centers for higher and lower order goods), infrastructure services (electricity, water and telecommunications), environment and open spaces (aesthetic of the area, cleanliness, circulation in the house, house price/rental value), mobility & public transport (distance to work, bus services, taxi services). Outcomes of the study revealed that the residents in the new towns developed by State Economic Development Corporations in Malaysia were satisfied with their living environment and their quality of life has improved. Notably, based on residents' perceptions the study found that all new towns under study were well served with infrastructure facilities such as electricity, telephone services and water supply. Neighbourhoods' livability of Benin City in Nigeria was far less liveable based on employment opportunities, housing, amenities, education, nuisance and socioeconomic dimensions (Omuta, 1988). This situation is similar to neighbourhoods' livability of cities in Ogun State, Nigeria, where neighbourhood facilities were found to be in a state of disrepair (Asiyanbola et al., 2012).

City governance was considered as the most important determinant of city livability by the cross-examination of people living in the continent of Africa and those living in the Diaspora (Lawanson et al., 2013). Other studies have investigated various factors in connection with livability such as dwelling units, housing services, neighbourhood and environment (Salleh, 2008). Also, Heylen (2006) conceptualized livability measurement to include; housing/ dwelling quality, physical environment quality, quality of social environment and safety of the neighbourhood. Likewise, the livability of Subang Jaya in Malaysia was measured through social elements, physical elements, functional elements and safety elements. The most important finding of the study revealed safety apprehensiveness among the residents (Leby and Hashim, 2010). Howley et al (2009) investigated neighbourhood satisfaction of the compact city environment of Dublin. This involves fieldwork through which a total of 50 apartments was randomly selected and surveyed from a list of apartments developed between 1996 and 2006 in the central area of Dublin. The study shows that the residents were not dissatisfied about compacted residential provision rather; they were dissatisfied because of inadequate facilities. Saitluanga (2013) investigates the livability of the city of Aizawl, India at the neighbourhood level based on stratified random sampling in selecting households in different localities of Aizawl.

The result of principal component analysis (PCA) conducted revealed that neighbourhood at the center have better livability elements compared to the neighbourhood at the periphery. Lee (2008) applied structural equation model (SEM) technique to measure the quality of life (QOL). The study adapted the well-known Detroit Area Study as the basic conceptual structure with adjustment to fit the social, cultural and geographical context of Taipei. A field survey of 331 Taipei residents was conducted to give subjective resident assessments of QOL.

A SEM analysis was then performed to explore the causal relationships among the QOL variables. QOL study has always been related to the liveable life, a liveable city can reasonably provide a high quality of life. Hence, Taipei respondents are more concerned with personal safety and public services, which are also the key influences on QOL for Taipei. Satu (2014) investigates the following aspect of livability of Dhaka; public transports, community facilities, open space, sense of community, a sense of safety and dwelling space. The study findings revealed that the planned neighbourhoods of the city of Dhaka have relatively low population and were characterized by high buildings compared to unplanned areas. Nevertheless, the community facilities, safety and dwelling space were found to be standard and satisfactory in all neighbourhoods. However, access to public transport, open space and sense of community were less satisfactory in all the neighbourhoods. Aigbavboa and Thwala (2014) explore the factorial validity of the neighbourhood features used in residential satisfaction studies. It is argued that not all identified neighbourhoods construct found in the literature will be effective in the measures of neighbourhood satisfaction. The study employed Delphi survey technique on fifteen sustainable human settlement experts in South Arica from which the conceptual variables for neighbourhood features was developed for the study. A questionnaire survey was conducted among the residents of the selected low-income housing in South Africa. The data collected for the study was analyzed for factorial validity through structural equation modelling (SEM). The result emanated from the SEM analysis validates only five indicators out of twenty-two indicators identified from the interview and literature review for the study. Leaning on the past studies, this study therefore adopt structural equation modelling (a second-order factor) to investigates the key factors of livability of planned residential neighbourhoods in Minna, Nigeria.

3. Methodology

The analysis of this study is based on primary data elicited through a survey questionnaire. Respondents were drawn from M.I. Wushishi estate, Bosso estate and Tunga low-cost of Minna, Niger State, Nigeria. Stratified random sampling was used to select various homes; stratified random sampling is a method of sampling that involves the division of a population into subgroups called strata. The strata containing subjects with similar characteristics (Cohen, 2007; Creswell, 2011) such as in this case housing unit types were considered. 400 questionnaires were distributed between the months of July and September 2014. Out of the distributed questionnaires, 366 duly completed questionnaires were used for the analysis. The conduct of the survey was undertaken all days in two sessions (Morning 10 am to 2 pm) and (Evening 4 pm to 7 pm). The questionnaire was administered by the researcher and other six enumerators. The data elicited was analyzed with the statistical package for the social science (SPSS version 22) and Analysis of Moment Structure (AMOS version 22) software for structural equation modelling (a second-order factor). In this study, livability was measured through the following; (i) housing unit characteristics; (ii) neighbourhood facilities; (iii) safety environment; (iv) economic vitality; (v) social interaction. However, a reliability test of Cronbach's Alpha value of 0.7 as benchmark (Pallant, 2007; Creswell, 2011) shows the factor 'social interaction' as unacceptable factor. Thus, social interaction was exempted following a Cronbach's

Alpha value of -0.947 as suggested by Pallant (2007). Other dimensions were analyzed with exploratory factor analyses (EFA), confirmatory factor analysis (CFA) and second-order factor. These four factors were further measured so as to confirm or reject the items measuring a particular construct (Tabachnick and Fidell, 2007, Victoria and Kamariah, 2014). This tests how indicators reflect the latent variables in a theoretical model (Zhu et al., 2008). The first-order confirmatory factor analysis, tests for reliability, convergent and divergent validity was carried out (See Table 1). The second-order factor analysis to show causal relationship of the endogenous variable and the exogenous variables was carried out as shown in Figure 2.

4. Results and Discussion

This study measures livability of planned housing estates through the following dimensions after the initial Cronbach's Alpha for reliability of items as mentioned earlier; (i) housing unit characteristics; (ii) neighbourhood facilities; (iii) safety environment; (iv) economic vitality. The livability items were extracted from previous studies (Omuta, 1988; Heylen, 2006; Leby and Hashim, 2010; Asiyanbola et al., 2012; Lawanson et al., 2013) (see Table 1). The items measurement was based on 5-piont Likert scale (Betram, 2009; Marques et al., 2015; Mohit and Hannan, 2012). The four factors- housing unit characteristics, neighbourhood facilities, safety environment and economic vitality were extracted based on eigenvalues of 1 shows cumulative variance explained of about 67%. The required thresholds for model fit of first-order confirmatory factor analysis (CFA) were met as shown in Figure 1. CFA serves as a mechanism to assess or observe how well the measurement items reflect their respective latent variable in the hypothesized model (Zhu et al., 2008). From the extant literature various goodness of model fit exists, for instance; p-value should be > 0.05 (Field, 2009) and where p-value criteria not met, other

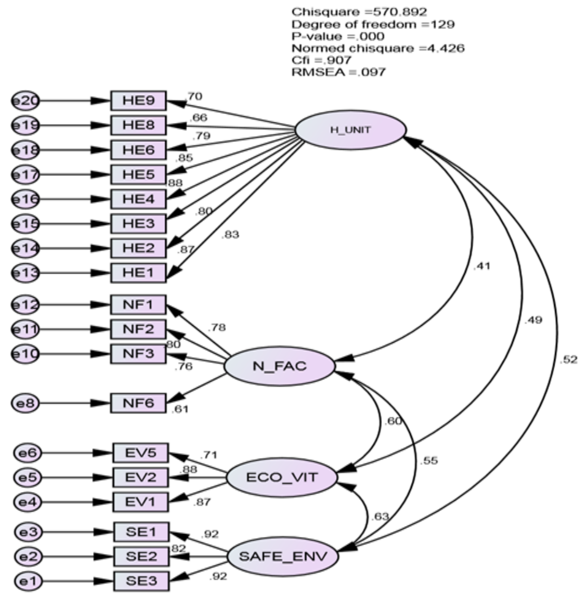

Figure 1: *A First-Order CFA Model for Livability Construct*

criterion must be satisfied. This includes- Root Mean Square of Approximation (RMSEA) value should not exceed 0.1 (Yuet et al., 2014; Marques et al., 2015; Mueler and Hancock 2008), while Comparative Fit Index (CFI) value should be greater than 0.9 (Richard, 2007; Mueler and Hancock 2008; Navabakhsh and Motlaq, 2009). Based on the normed chi-square test score and the two fit indices- Root Mean Square of Approximation (RMSEA) and Comparative Fit Index (CFI) in Figure 2, the model fits the data. These indices as stated in (Adewale et al., 2013) are used in the event of poor fit of a model based on significant p-values that results in a large sample chi-square test.

The construct reliability and validity of the first-order CFA model was conducted. Each construct must produce an acceptable value of construct reliability (CR) and average

Table 1: *Construct reliability, Convergent Validity and Divergent Validity of the Modified Model*

	CR	AVE	MSV	ASV	H_UNIT	SAFE_ENV	ECO_VIT	N_FAC
H_UNIT	0.934	0.639	0.269	0.225	0.799			
SAFE_ENV	0.919	0.792	0.399	0.324	0.519	0.890		
ECO_VIT	0.862	0.678	0.399	0.334	0.487	0.632	0.823	
N_FAC	0.829	0.550	0.365	0.279	0.410	0.551	0.604	0.742

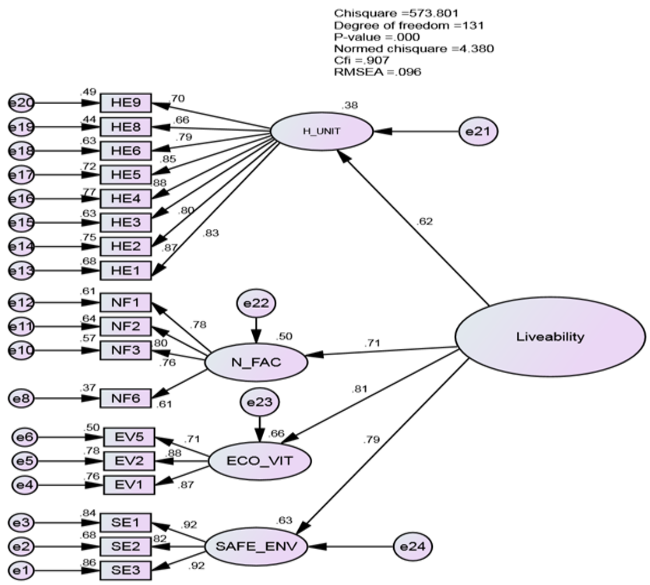

Figure 2: *A Second-Order CFA for Livability Construct*

variance extracted (AVE). The values for the construct reliability, i.e., composite reliability or CR, and average variance extracted (AVE) were needed in order to obtain the divergent validity. The accepted value for CR should be at least 0.60 and 0.50 for AVE (Yuet *et al*., 2014). Adewale *et al*., (2012a) and Adewale *et al*., (2012b), opined that CR to be greater than 0.7 while AVE above 0.5 but should be greater than average shared variable (ASV) and maximum shared variable (MSV). From the result of the construct reliability and validity (Table 1), it is evident that there is no validity problem.

Results from the first-order measurement model for livability construct were applied in the second-order model as the model satisfied the assumption of an existing higher order factor model with four or more first-order factors (Adewale *et al*., 2013). Thus, in the second-order model, livability serves as a latent variable measured by the four constructs as the first-order factor which became the observed variables for livability. Again, the CFA was applied and the model fit the data adequately. The result of the second-order model as shown in Figure 2 indicates that a higher order latent factor (livability) observes the association among the constructs, and the results give adequate model fitness given the normed chi-square test score and the two fit indices- Root Mean Square of Approximation (RMSEA) and Comparative Fit Index (CFI) as shown in Figure 2.

Figure 2 shows the robust Comparative fit index (CFI) of 0.907, this is higher than the minimum value of 0.90 set for good fit criteria. A model is said to be a good fit if the CFI is above the cut-off value of 0.90 (Mueler and Hancock 2008; Navabakhsh and Motlaq, 2009). The robust root mean square error of approximation (RMSEA) with 90% confidence interval was found to be 0.096 less than the maximum value cut-off set for good fit. Therefore, the evaluation of the RMSEA (90% CI), and the CFI fit indexes indicated an acceptable fit of the second-order measurement model based on the data collected. The second-order model shows that housing unit characteristics variables was best measured by eight indicators, neighbourhood facilities was measured by four indicators, economic vitality best measured by three indicators while safety environment best described by three indicators (detail indicators in Table 2).

Table 2: *Model Constructs and Indicators*

Dimensions	Indicators
Housing Unit Characteristics (H_UNIT)	House Size (HE1), Living area size (HE2), Dining size (HE3), Bedroom size (HE4), Kitchen size (HE5), No of bathroom (HE6), House ventilation (HE8), Affordability (HE9)
Neighbourhood Facilities (N_FAC)	Children education (NF1), Healthcare (NF2), Shopping centers (NF3), Open/green space (NF6)
Economic Vitality (ECO_VIT)	Monthly income (EV1), Daily transport cost (EV2), Public transport (EV5)
Safety Environment (SAFE_ENV)	Crime safety (SE1), Accident safety (SE2), Property safety (SE3)

On the whole, neighbourhood livability was found to be best measured by four dimensions (Figure 1). The standardized coefficients between latent variables and the higher-order livability revealed that ECO_VIT (r = 0.81) dimension is the most significant indicator of neighbourhood livability. This is followed by SAFE_ENV (r = 0.79), N_FAC (r = 0.71) and H_UNIT (r = 0.62).

5. Conclusion

From the results, it can be deduced that what a city offer in terms of inhabitants' empowerment that is the economic vitality (income, mobility and mobility cost) most significantly measures its livability. In support is the safety environment (crime level, accidents and property safety). Also, of importance are the neighbourhood facilities (children education facilities, healthcare, shopping and open/green space). Lastly, housing unit characteristics contributes substantially to the city livability as r = 0.62, given the past studies benchmark of 0.60 as substantial

(Henseler *et al*., 2009; Ramli *et al*., 2014). From the foregoing, this study confirmed and uses the approach of testing for a second-order measurement of livability. In line with Adewale *et al* (2013), the second-order model with the first-order factors as indicators is more parsimonious and provides theoretically error-free estimates of both the general and specific factors. Therefore, the higher-order factor of livability with specific four-factor model with general eighteen indicators in this study is validated. This implies that in creating liveable neighbourhoods, the factors examined in this study are very fundamental and need to be considered in development planning. Provision of amenities results in a more liveable neighbourhood that enhances the quality of life of the people, and in the long run improves the overall sustainability of the development.

References

Abd El-Fattah T.M.A. (2011). Landscape Infrastructure and Liveable Communities: A Case Study of New Cairo Egypt, (March), 393.

Abdelbaset, M. M. S. (2015). Livability of High-Rise Districts Case Study of West Bay in Doha. Qatar University.

Adewale, A. A., Daud, M. and Salami, L. O. (2013). A Second-Order Factor Gender-Measurement Invariance Analysis of Financial Exclusion in Ilorin, Nigeria *International Journal of* Trade*, Economics and Finance, Vol. 4, No. 6.*

Adewale, A.A., Yusuf, M.B.O., Ghani, G.M., Meera, A.K.M and Abdul Manap, T.A. (2012a). The Role of Institutional Trust in the Adoption of Gold Dinar in Kelantan: An Empirical Analysis. *Journal of Applied Sciences* 12 (20): 2148-2155.

Adeyemi, A. A., Pramanik, A. H., and Meera, A. K. M. (2012b). A Measurement Model of the Determinants of Financial Exclusion among Muslim Micro-entrepreneurs in Ilorin, Nigeria, *Journal of Islamic Finance*, Vol. 1 (1): 030 – 043. IIUM Institute of Islamic Banking and Finance.

Aigbavboa, C.O., Thwala, W.D. (2014). Factorial validity of the predictive effects of residents' needs and expectations in South Africa public housing. *Socioeconomica – The Scientific Journal for Theory and Practice of Socio-economic Development,* 3(6): 203-218

Asiyanbola, R., Raji, B. and Shaibu, G. (2012). Urban livability in Nigeria- A pilot study of Ago-Iwoye and Ijebu-Igbo in Ogun State. Journal of Environmental Science and Engineering.

Balsas, C. J.L. (2004). Measuring the livability of an urban centre: an exploratory study of key performance indicators, *Planning Practice & Research, Taylor and Francis Vol. 19, Issue 1, 2004 Pp 101-110*

Barbara, M.B. (2010). Structural equation modelling with Amos: Basic Concepts, Applications and Programming. Second edition, Routledge, Taylor and Francis Group, LLC

Betram, D. (2009), Likert Scales. Topic Report, the Faculty of Mathematics University of Belgrad.

Bouffard, D. Cook, S. Eisenberg, S. and Mowris, R. (2013). Investigating the Relationships between Urban Design, Microeconomics, and Livability: A Case Study of Hong Kong. Worcester Polytechnic Institute.

Buys, L., Vine, D., and Miller, E. (2013). What makes inner City high density living attractive? Insight from residents in Brisbane, Australia, *Environmental Management and Sustainable Development, 2(1), Pp. 14-33*

Casselati, A. (1997). 'The Nature of Livability' in Lennard, SH et.al (eds). Making Cities Liveable. International Making Cities Liveable Conferences, California, USA: Godolier Press.

Centre for Liveable Cities (2011). Liveable & Sustainable Cities for the Future: World Cities Summit 2010 Conference Proceedings.

Chaudhury, A. H. (2005). Urban Livability, Decentralisation and Development: A Comparative Study on Dhaka and Khulna Cities URP Discipline, Khulna University.

Cohen, L., Manion, L. and Morrison, K. (2007). Research Methods in Education, Sixth edition, ROUTLEDGE, Taylor & Francis Group.

Creswell, J. W. (2011). Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research 4th Edition.

Dasimah, O. (2009). Assessing Residents' Quality of Life in Malaysian New Towns. *Asian Social Science Vol. 5, No.6*

Eckert, R. and Schinkel, U. (2009). Liveable City TP. Ho Chi Minh - Adaptation as response to impacts of climate change. Proceedings REAL CORP 2009 Tagungsband 22-25 April 2009, Sitges.

Economist Intelligence unit (2012). 'A Summary of the livability Ranking and Overview'. Available online at www.eiu.com [Accessed on 22/12/13].

Field, A. (2009). Discovering Statistics using SPSS. Third Edition, SAGE Publication Ltd.

Henseler, J., Ringle, C.M. and Sinkovic, R.R (2009). The use of Partial Least Squares Path Modelling in International Marketing.

Adv. Int. Market., 20: 277-319.

Heylen, K. (2006). Livability in social housing: three case-studies in Flanders. Residential Environments and People, ENHR Conference July 2006. Ljubljana, Slovenia.

Howley, P., Scott, M. and Redmond, D. (2009). Sustainability versus Livability: An Investigation of Neighbourhood Satisfaction, *Journal of Environmental Planning and Management* 52:6, 847-864.

Lawanson, T., Salau, T. and Yadua, O. (2013). Conceptualizing the Liveable African City. *Journal of Construction Project Management and Innovation* Vol. 3 (1): 573-588.

Leby, J. L. and Hashim, A. H. (2010). Livability Dimensions and Attributes: Their Relative Importance in the Eyes of Neighbourhood Residents, *Journal of Construction in Developing Countries,* Vol. 15(1).

Lee, Y. J. (2008). Subjective quality of life measurement in Taipei. *Building and Environment*, 43:1205-1215.

Li, C., Sun, L. and Jones, P. (2012). Livability of High-rise Housing Estates: A Resident-centred High-Rise Residential Environment Evaluation in Tianjin, China, 48th ISOCARP Congress 2012.

Lowe, M., Whitzman, C., Badland, H., Davern, M., Hes, D., Aye, L., Butterworth, I. and Giles-Corti, B. (2013). Liveable, healthy, sustainable: What are the key indicators for Melbourne neighbourhoods? Research Paper 1, Place, Health and Livability Research Program, University of Melbourne http://mccaugheycentre.unimelb.edu.au/research/health_and_livability Accessed on 12 August 2017.

Marques, D., Pinheiro, M. R., Matos, A. P., and Marques, C. (2015). Confirmatory Factor Analysis of the QRI Father's Version in a Portuguese sample of adolescents. *Procedia - Social and Behavioral Sciences* 165.

Memon, A. H., Abdul Rahman, I., Abdul Aziz, A. A. and Nor Hazana, A. (2012). Using Structural Equation Modelling to Assess Effects of Construction Resource Related Factors on Cost Overrun. *World Applied Sciences Journal 20 (Mathematical Applications in Engineering):* 06-15.

Mohit, M. A. and Hannan, M. H. E. (2012). A Study of Crime Potentials in Taman Melati Terrace Housing in Kuala Lumpur: Issues and Challenges. *Procedia - Social and Behavioral Sciences,* 42:271 – 283.

Mueler, R.O. and Hancock, G.R. (2008). Best Practices in Structural Equation Modelling in J.W. Osborne (ed). Best Practices in Quantitative Methods. (London: Sage Publications).

Namazi-Rad, M., Perez, P., Berryman, M. and Lamy, F. (2012). An experimental determination of perceived livability in Sydney, ACSPRI Conferences, RC33 Eighth International Conference on Social Science Methodology Pp. 1-13.

Navabakhsh, M. and Motlaq, M. (2009). Effects of urban information and communication technology on sustainable development. *Journal of Food, Agriculture & Environment* Vol.7 (3&4):891-897.

Omuta, G.E.D. (1988). The Quality of Urban Life and The Perception of Livability: A Case Study of Neighbourhoods in Benin City, Nigeria, *Social Indicators Research* 20: 417- 440.

Ozo, A.O. (1990). Low Cost Urban Housing Strategies in Nigeria, *Habitat International.* Vol.14 No 1, 41-54.

Pacione, M. (2003). Urban environmental quality and human wellbeing-a social geographical perspective, *Landscape and Urban Planning* 65: 19-30.

Pallant, J. (2007). SPSS Survival Manual A Step by Step Guide to Data Analysis using SPSS for Windows third edition, Open University Press, McGraw-Hill Education, McGraw-Hill House.

Pandey, R.U., Garg, Y.G. and Bharat, A. (2014a). Quantitative Approach for Understanding Perspectives on Livability in India Context, *International Journal on Emerging Technologies Volume* 5, Issue: 1

Pandey, R.U., Garg, Y.G. and Bharat, A. (2014b). Understanding Qualitative Conceptions of Livability: An Indian Perspective. *International Journal of Research in Engineering and Technology (IJRET),* Volume 2, Issue: 12.

Ramlia, A., Akasahb, Z. A., Mohd Masirinc, M. I. (2014). Safety and Health Factors Influencing Performance of Malaysian Low-Cost Housing: Structural Equation Modelling (SEM) Approach. *Procedia - Social and Behavioural Sciences* 129, 475 – 482

Richard, S. (2007). The measurement of quality of life and its relationship with perceived health status in adolescents. Ph.D Thesis, Trinity Western University.

Safer, C.S., Koo Lee, B., Turner, S., (2000). A tale of three greenway trails: user perceptions related to quality of life. *Landscape Urban Planning* 49, 163–178.

Saitluanga, B. L. (2013). Spatial Pattern of Urban Livability in Himalayan Region: A Case of Aizawl City, India

Salleh, A. G. (2008). Neighbourhood factors in private low-cost housing in Malaysia. *Habitat International* 32:485-493

Sanford, E. (2013). *What Is the Difference between Livability and Sustainability?* Retrieved October 24, 2017, from Cambridge Systematics: http://www.camsys.com/kb_experts_livability.htm

Sanoff, H. and Sawhney, M. (1970). Residential Livability: A Study of User Attitudes towards their Residential. *1st Ann. Environ. Design Res. Assoc. Conf, 1970.*

Satu, S. A. (2014). An examination of the livability of dense urban neighbourhoods in Dhaka: the impacts of urban planning. The University of Hong Kong.

Song, Y. (2011). 'A Liveable City Study in China Using Structural Equation Models', Department of Statistics, Uppsala University.

Southworth, M. (2007). 'Morphology of the Liveable City', In: Urban Forms and Metropolitan Spaces April 2-3 2007, Roma, Università degli Studi di Roma Sapienza, Facoltà di Ingegneria, Berkely.

Sule, A.I. and Mohit, A.M. (2015). Investigating the Application of CFA in the Livability Assessment of Public Low-income Housing in Nigeria. *Journal of Architecture, Planning & Construction Management* Vol. 5 issue 1.

Tabachnick, B.C., and Fidell, L.S. (2007). Using multivariate statistics (5th edition). Boston, MA: Pearson Education, Inc.

Timmer, V. and Seymour, N.K. (2006). 'The Liveable City': The World Urban Forum 2006 –Vancouver Working Group Discussion Paper International Centre for Sustainable Cities.

Tomarken, A. J. and Waller, N. G. (2005). Structural Equation Modelling: Strengths, limitations, and Misconceptions. *Annual Review of Clinical Psychology, 1*, 31–65.

Van den Heuvel, N. (2013). A conceptual analysis of livability and the translation of livability into policy; A case study of Bogotá; livability as a guide for the policy of three mayors in the period from 1995 to 2007.

Van Dorst, M. (2012). 'Livability', in Bueren EV et al (eds), Sustainable Urban Environments: An Ecosystem Approach, Springer, New York, 223-242.

VanZerr, M., and S. Seskin (2011). Recommendations Memo #2 Livability and Quality of Life Indicators.CH2M Hill, Portland.

Victoria, H. K., Kamariah M. (2014). A New Model of Green Purchase Intention and its Derivatives: Confirmatory Factor Analysis Validation of Constructs. *Information Management and Business Review Vol. 6, No. 5*

Woolcock, G. (2010). Measuring Up? Assessing the Livability of Australian Cities, Working Paper, Urban Research Program Griffith University - Nathan

Yuet, F. K. C., Yusof, H. and Mohamad, I. (2014). Confirmatory Factor Analysis of the Niche-Malaysian Teacher Leadership Measurement Model, *International Journal for Innovation Education and Research,* 2(07), 2014

Zhu, Q., Sarkis, J., Lai, K.-H. (2008). Confirmation of a measurement model for green supply chain management practices implementation. *International Journal of Production Economics* 111 (2), 261–273