Received 12 August 2021
Revised 4 February 2022
Accepted 21 February 2022

An analysis of the determinants of office real estate price modelling in Nigeria: using a Delphi approach

AbdurRaheem A. Yakub
Department of Real Estate, Universiti Teknologi Malaysia, Skudai, Malaysia and Department of Estate Management, Hussaini Adamu Federal Polytechnic, Kazaure, Nigeria, and
Kamalahasan Achu, Hishamuddin Mohd Ali and Rohaya Abdul Jalil
Department of Real Estate, Universiti Teknologi Malaysia, Skudai, Malaysia

Abstract

Purpose – There are a plethora of putative influencing variables available in the literature for modelling real estate prices using AI. Their choice tends to differ from one researcher to the other, consequently leading to subjectivity in the selection process. Thus, there is a need to seek the viewpoint of practitioners on the applicability and level of significance of these academically established variables.

Design/methodology/approach – Using the Delphi technique, this study collated and structured the 35 underlying micro- and macroeconomic parameters derived from literature and eight variables suggested by 11 selected real estate experts. The experts ranked these variables in order of influence using a seven-point Likert scale with a reasonable consensus during the fourth round (Kendall's $W = 0.7418$).

Findings – The study discovered that 16 variables are very influential with seven being extremely influential. These extremely influential variables include flexibility, adaptability of design, accessibility to the building, the size of office spaces, quality of construction, state of repairs, expected capital growth and proximity to volatile areas.

Practical implications – The results of this study improve the quality of data available to valuers towards a fortified price prediction for investors, and thereby, restoring the valuers' credibility and integrity.

Originality/value – The "volatility level of an area", which was revealed as a distinct factor in the survey is used to add to current knowledge concerning office price. Hence, this study offers real estate practitioners and researchers valuable knowledge on the critical variables that must be considered in AI-based price modelling.

Keywords Office real estate, Price prediction/modelling, Price determinants, Delphi technique, Subjectivity

Paper type Research paper

1. Introduction

Office real estate provides a shelter that houses business and industrial activities, and hence, compared to a factor of production (Kempf, 2016). It is also seen as a financial asset to its holder, thus an income-producing investment medium that yields proceeds. However, before any alienation, real estate prices are predicted through models using real estate features as the determining variables. Such predictions serve as a quantitative estimate of both the benefits and liabilities of real estate ownership (Selim, 2009). The present trend in price prediction is the adoption of Artificial Intelligence (AI), which enables the machine to learn, autonomously, from the dataset provided to it involving the determinant variables (inputs) alongside the prices as outputs.

Nevertheless, while a large number of price determinants abound in literature (Öven and Pekdemir, 2006a) alongside extensive literature on office price determinants (Bera and Kangalli Uyar, 2019), there is no consensus among researchers on the specific level of influence of variables on price (Adair *et al.*, 1996). Hence, variable selections depend on a substantial judgement of the appraiser (Yacim and Boshoff, 2014) which is derived from his experience cum familiarity of the local market. While this process was initially accepted as a

Property Management
Vol. 40 No. 5, 2022
pp. 758-779

0263-7472
DOI 10.1108/PM-08-2021-0060

reliable and accurate means of price determination (Grissom and Diaz, 1991), researchers in recent times have continuously criticised the validity of the variable selection process with concerns bordering around the perceived subjectivity embedded in their selection (Guijarro, 2021; Yan *et al.*, 2007).

As such, these choices are devoid of scientific rigour, which may affect the output of the established models, and hence, the need to scientifically rate the adopted variables per their respective significance in the Nigerian real estate sector. Available literature fails to seek the opinion of experts who are actively involved in professional practice in identifying the specific and most significant variables to be tested as affecting office real estate. Rather, they adopt the variables recognised from current studies that fail to include local contents specific to the Nigerian marketplace such as Oyewole and Ajayi (2016) and Udoekanem *et al.* (2015b). Meanwhile, researchers have acknowledged that price-determining factors fluctuate among real estate sectors (Sanderson, 2015), vary among locations (Öven and Pekdemir, 2006b; Bera and Kangalli Uyar, 2019) and vary overtime (Kabaivanov and Markovska, 2021), and hence, they are not static. Thus, there is a need to explore local experts' views towards ascertaining the specific price-influencing variables in northern Nigeria.

It is worth noting that a considerable amount of research has been carried out on variable determinants as it concerns residential real estate (Bello and Bello, 2007); however, not much has been done as it relates to commercial office real estate (Ustaoğlu, 2003). This neglect in the office real estate is still visible two decades after the observation by Ustaoğlu (2003). Among those who concentrated on identifying residential real estate determining variables in Nigeria are Abidoye and Chan (2016), Egbenta *et al.* (2021) and Oloke *et al.* (2021).

However, the few that ventured into value determinants of office real estate have mostly concentrated on the macroeconomic variables without giving attention to the micro variables. Among them are Udoekanem *et al.* (2015a) whose study considered five macroeconomic variables including gross domestic product (GDP), inflationary rates, vacancy rates, monetary policy rates and employment rates in determining office rental variables in Abuja as well as Udoekanem *et al.* (2014), Oyewole and Ajayi (2014) and Iroham *et al.* (2013).

The stance of these Nigerian researchers contradicts the global best practice where researchers have affirmed micro variables to be significant in price determination. Among these are those who affirm building age (Olszewski *et al.*, 2018; Kołodziejczyk *et al.*, 2020), location (Kopczewska and Lewandowska, 2018; Berawi *et al.*, 2019; Tse-Hsiung and Perng, 2019), building type (Kangallı Uyar, 2020), vacancy rate (Kangallı Uyar, 2020) proximity to transportation facilities (Bera and Kangalli Uyar, 2019; Tse-Hsiung and Perng, 2019).

Hence, valuers have been variously criticized for inaccurate price predictions arising from the inappropriate selection of price-determining variables including the quality of data (Dunse *et al.*, 2010). This has implications on the credibility and integrity of appraisers (Adegoke, 2016; Abidoye and Chan, 2017), plummeting foreign direct investment (Gelos and Wei, 2002; Lim *et al.*, 2006) and sluggish investment performance (Eziukwu, 2019), among others.

As a result, this study is aimed at methodically ascertaining the critical influencing variables affecting office real estate prices as affirmed by practising professionals to reduce the level of subjectivity in variable selection. In accomplishing this goal, the research adopts the Delphi technique alongside the Relative Importance Index (RII). Thus, the outcome of this work is an advancement of preceding attempts at isolating the significant variables that determine office real estate price as we fill the gap created in the current literature. This will assist researchers and practitioners alike in obtaining an objective price-modelling platform for the Nigerian office real estate market. In particular, it will guide investors' resolutions towards circumventing volatile areas.

This research is fashioned into five sections. The review of the relevant empirical literature on the factors that affect office real estate prices follows the introductory section.

Section 3 is the methodology section while sections 4 and 5 present the results and discussion, followed by the conclusion in section 5.

2. Literature review

2.1 Modelling techniques in real estate pricing

Modelling is seen as the outcome predictions from known to unknown where known variables are adopted in predicting unknown variables using statistical analysis and deductions arising from historic relationships (Hoptroff, 1993). Models in real estate prices can be categorised into traditional and machine learning models (Clark and Lomax, 2018). Traditional models stem from the comparative method of valuation evolving to more advanced models including multiple regression analysis (MLR) otherwise termed the hedonic price modelling (HPM). MLR has been criticised for being a statistically imperfect technique for small data sets (Rossini, 1997) and inadequate for non-linear datasets (Pagourtzi *et al.*, 2007), and hence, the advent of machine-learning models where practitioners utilised econometrics and other AI and data mining related techniques.

The econometric models involve time-series analysis such as Box Jenkins's autoregressive integrated moving average (ARIMA), generalised autoregressive conditional heteroskedastic (GARCH) (Kim, 2004), vector autoregressive model (VAR) (Ge *et al.*, 2019) and other spatial analysis models. A distinction between these models is that VAR would not perform well if a huge number of time-series is involved (van de Minne *et al.*, 2021), while ARIMA and GARCH are capable of processing a large number of time series. ARIMA has both a constant variance and mean, while GARCH has a varying variance but a constant mean (Crawford and Fratantoni, 2003). However, most of these econometric models suggest that macroeconomic variables, particularly GDP which is a demand-side variable, regularly impacts real estate pricing (Kiehelä and Falkenbach, 2014).

These techniques are capable of autonomously selecting variables and identifying the significance of interactions among these variables, and hence, there is an issuance of weights to them, which enables the capturing of the nonlinearities towards precise and robust price estimation (Bin *et al.*, 2019). Thus, Yalpir (2014) sees the exploration of AI in valuation as a necessity to the real estate professionals and thus, considered it as crucial in carrying out real estate valuation services.

Some of the AI models include artificial neural network (ANN) which uses its network to compare its predictions with the earlier given outputs. Using a reverse path, these AI models begin to correct all the weights between the individual neurons based on the contrast between the two results (Valier and Micelli, 2020). The ANN model has been proved to have a price prediction accuracy of ±10%, better than the HPM with ±15% (Del Giudice *et al.*, 2017). Another form of the neural network is the fuzzy neural network, otherwise termed adaptive neuro-fuzzy inference system, which pools the ANN and Fuzzy Logic together. It is also seen to have a ±10% error margin (Jian-Jiun *et al.*, 2012). Other data mining related models include support vector machine, elastic net, XGBoost, Light Gradient Boosting Machine (LGBM), random forest, kernel ridge, lasso and gradient boost (Dey and Urolagin, 2021); extra trees regression (Hu *et al.*, 2019); decision tree (Sing *et al.*, 2021) and K-nearest neighbour (Pow *et al.*, 2014).

However, of all these models, random forest is found to be the most successful algorithm in real estate price modelling (Ja'afar *et al.*, 2021) as Hong *et al.* (2020) reported a 5.5% error.

2.2 Determinants of office real estate price

Investigation into the determinants of office real estate took its root from early researchers such as Rosen (1984) who explored the American office real estate market by developing a structural office model. Gardiner and Henneberry (1989) formulated a spatial disaggregated model for office rents, while Giussani *et al.* (1993) explored the European office market and

concluded that prices are determined by demand-side variables. However, depending on the model type and field of adoption, there is a broad variation in the ranges of variables considered in office-price modelling (Öven and Pekdemir, 2006a).

Generally, variables affecting real estate are divided into micro variables synonymous with supply factors and macroeconomic variables synonymous with demand factors (Zawir Simon *et al.*, 2015). Micro variables include the structural parts of the building, such as the material used in construction, the quality, the design and architectural aesthetics, while the locational and neighbourhood aspect deals with variables depicted in both absolute and relative location terms involving general accessibility and relative location in terms of proximity to a specific use. On the other hand, the macroeconomic variables involve the pattern of GDP growth influenced by the service sector employment, the inflationary trend, exchange rate, interest rates and economic growth, among others.

However, Beltratti and Morana (2010) affirm that there is a bidirectional correlation between the price of real estate and micro- cum macroeconomic variables. Likewise, Lam *et al.* (2009) noted that in assessing real estate prices, both macro and micro variables need to be considered. Hence, by implication, price-influencing variables are not governed by either micro- or macroeconomic variables in isolation, but by both. Consequently, using both groups of variables will produce better and more befitting outcomes (Granziera and Kozicki, 2015) in addition to a directional link price prediction (Li and Chen, 2015) (see Figure 1).

2.2.1 Micro variables that influence real estate price. In modelling real estate price generally, many researchers have verified micro variables and hence, physical features of office buildings, as the defining variable in their rent cum price determination (Öven and Pekdemir, 2006a); thus, it is a fundamental price determination criteria (Chiarazzo *et al.*, 2014; Zawir Simon *et al.*, 2015).

Figure 2 shows the number of researchers that acknowledge each of the micro variable determinants as affecting office real estate price. Four major variables are commonly adopted in literature. For instance, the variable, "distance from transportation hubs" such as highway interchange, transit station, airports and other public squares appear in 23 pieces of literature and are hence the most commonly acknowledged micro factor in literature. Some of the researchers that considered distance from transportation hubs include Dunse *et al.* (2002), Nappi-Choulet and Maury (2009), Farooq *et al.* (2010) and Wan Rodi *et al.* (2019).

Vacancy rates within the vicinity record 17 appearances, while the distance from a shopping mall and Central Business District (CBD) alongside building characteristics and architectural design qualities and aesthetics take nine points each. Another equally commonly adopted variable in literature is the age of the building as it was adopted by eight researchers in the literature considered.

2.2.2 Macroeconomic variables. Macroeconomics concerns the effect of all economic decisions in a system as a whole, taking into account all capital investments, purchases, levels of exports, price levels and even employment (Wyatt, 2013). Therefore, Razali (2015) pointed out that trends in real estate prices often affect a nation's macroeconomic settings,

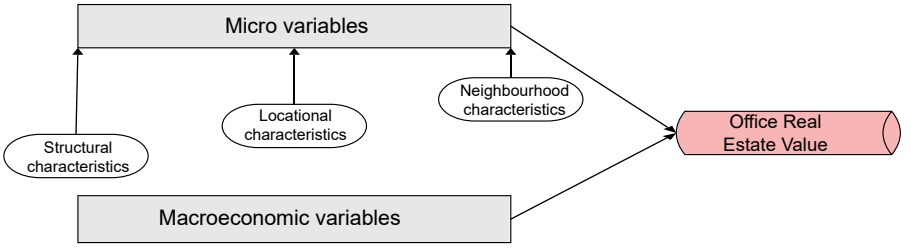

Figure 1.
Factors affecting office real estate price

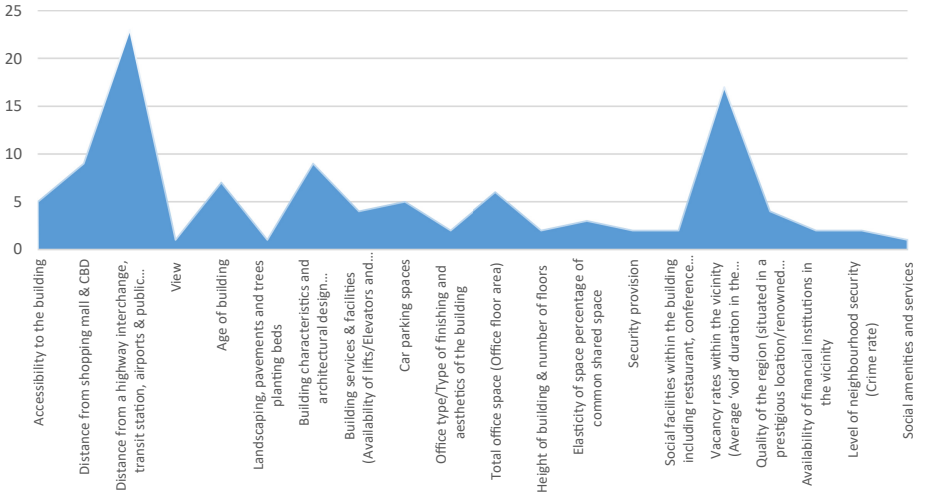

Figure 2.
Adoption of micro variable determining of office real estate price in the literature

leading to the adoption of macroeconomic variables by researchers in ascertaining real estate prices (Ojetunde, 2014; Öven and Pekdemir, 2006a; Radonjić *et al.*, 2019; Udoekanem *et al.*, 2015b).

A summary of variables adopted in the literature concerning office real estate is shown in Figure 3.

As seen from Figure 3, GDP ranked highest with 19 counts, while lending rates and rate of employment rates in the office sector closely followed with 18 and 17 counts respectively. GDP is well acclaimed in literature as a major determining variable of real estate generally. Other significant macroeconomic variables in the literature include expected rental growth/capital growth (12), inflationary trend/rates (eight) and available office stock (market portfolio and density of office buildings) which also recorded eight appearances.

3. Methodology

The Delphi technique was used in this analysis to explore possible variables for use in office real estate price modelling. Delphi is a consensus-seeking approach using a set of

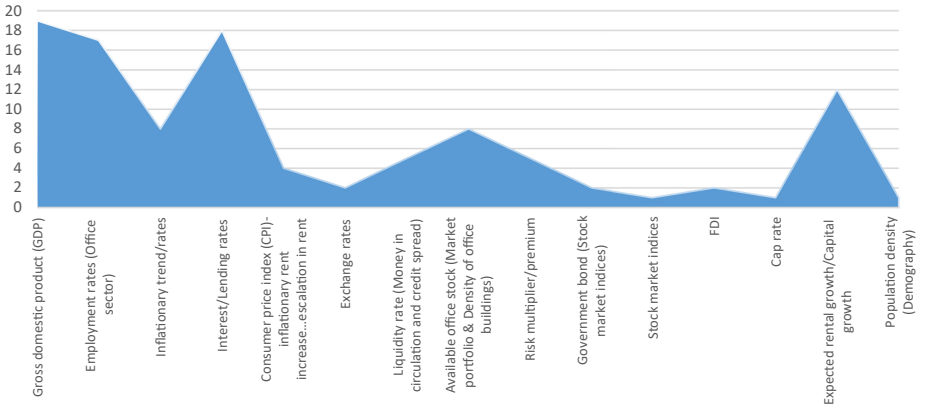

Figure 3.
Adoption of macroeconomic variable determining of office real estate price in the literature

questionnaires provided to experts. It is conducted through repeated rounds giving the experts the ability to rethink their answers confidentially without any intervention from other panellists (Kim and Yeo, 2018). The result is then analysed using a variety of statistical calculations and conclusions (Roy *et al.*, 2014). It is agreed that the Delphi approach is useful because it only deals with the opinion of experts who are interested in the subject matter, thereby gaining legitimacy through intersubjectivity (Hasson *et al.*, 2000).

Moreover, Gough (2015) affirm that mixing research paradigms by combining qualitative and quantitative research techniques allows for multiple levels and perspectives in research. Hence, the first round of the Delphi was used as a qualitative means of data collection in this research. To elucidate the field of knowledge involving variable adoptions in real estate price prediction, the subsequent rounds were adopted in the form of quantitative rounds.

In choosing the ideal number of rounds, Ludwig (1994) states that a range of 3–5 rounds can be assumed to be sufficient, depending on the research, whereas Pivo (2008) believes that three to four rounds are adequate to attain convergence. Therefore, in their survey, Gani *et al.* (2015) and Pivo (2008) adopted three rounds. However, rather than pegging the number of rounds, Brady (2015) argues that once the predetermined thresholds are reached by consensus, the implementation of the Delphi process should be terminated. Hence, this study continued the Delphi rounds until consensus was reached at the fourth round.

Therefore, as a preliminary round, the first round of the survey presented the research subject and collected reactions from the panellists using open-ended questions on factors affecting prices of office real estate. Hence, this approach gave the panellists a degree of freedom to answer questions that contributed to a large amount of information produced, as additional themes were developed from these responses in conjunction with the factors derived from the literature. These were formed into a single questionnaire which was passed to two real estate practising professionals and one in academia who vetted and corrected the questionnaire prior to implementation. This led to the modification of the parameters and their subcategories through grouping and characterisation.

Hence, the improved questionnaire was implemented in the second round consisting of closed-ended questions. This round serves as the commencement of the consensus-seeking rounds as a seven-point Likert scale ranking was adopted by the experts in ranking the level of influence that the factors have on office real estate prices. At this stage, the experts were allowed to further suggest vital variables and rate the variables in the questionnaire. After reviewing the answer in each round, the subsequent rounds were integrated with feedback and recirculated to inspire the panellists while allowing them a chance to re-evaluate their initial responses. The third and fourth rounds were a repetition of the second round where they reviewed the variables while reducing the scores of uninfluential variables that were highly scored in the previous round. The first round of the Delphi sessions lasted five weeks which resulted in reminders being sent to some of the panellists. However, responses from the subsequent sessions were faster, except for a few members of the panel. In total, all responses were retrieved within four months.

In analysing the responses received, the RII alongside MVs (mean value (MV)) and Standard Deviation (SD) were applied. RII was adopted to further confirm the MV and formally rank the indicators as Lam *et al.* (2007) affirm that MV and RII produce related results when rating variables. Johnson and LeBreton (2004) affirm that RII is one of the most dominant and successful analytic tools, which considers the effect of a predictor in solitude from other predictors, and is thus commonly used for Likert scale based data analysis (Aghili *et al.*, 2019; Binoy *et al.*, 2020).

In creating the class interval for the RII values, a 0.14 interval was adopted for scores 1 to 6. However, a higher target, and therefore a smaller range was set out for the highest rank (7), thus only 0.10 was allowed. Likewise, for the MV, a range of 1.04 was allowed between scores 1 and 6. Thereafter only 0.70 was allowed for the highest rank of 7 (see Table 1).

$$\text{RII} = \sum \frac{W}{AN} * 100 \quad (0 \leq \text{RII} \leq 1)$$

where $W = 7n_7 + 6n_6 + 5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1$

(W is therefore seen as the weight assigned to each variable by the expert multiplied by the number of experts that allotted the same weight)

N = number of respondents

A = highest Likert scale weight

Hence, $\text{RII} = \frac{7n_7+6n_6+5n_5+4n_4+3n_3+2n_2+1n_1}{7 * N}$

At each round, the MV, SD and the RII were calculated alongside Kendall's Coefficient of Concordance (Kendall's W). The SD is seen as the benchmark index of variability. It is the spread of the figures from the mean; therefore, lower SD of a mean distribution indicates a more precise estimate. Khodyakov *et al.* (2017) adopted only SD ≤ 1 and MV > 5 which corresponds with 71% in a seven-point Likert scale, while Smythe *et al.* (2017) accepted SD < 2.

However, in determining the acceptability criteria, this research adopts MV of 4.55 and above at the preliminary rounds (rounds 2 and 3) which represent RII of 65%, while only MV ≥ 5.25 which is equivalent to 0.75 (RII) is tolerable at the final round. Therefore, since the solitary aim of this research is the identification of the most significant real estate price-determining variables, only "extremely influential" and "very influential" variables were selected. The "very influential variables" are those that met the threshold of 5.25 ≤ MV ≤ 6.29 equivalent to 0.75 ≤ RII ≤ 0.89, while the "extremely influential" variables represent those with scores of 6.30 ≤ MV ≤ 7.00 and 0.90 ≤ RII ≤ 1.00 respectively.

Concerning SD, SD ≤ 2 is acceptable for inclusion at the preliminary rounds, while SD value ≤ 1 is acceptable at the final round (Table 2).

Table 1.
Level of influence

Guide	RII values	Mean values	Score
Extremely influential	0.90 ≤ RII ≤ 1.00	6.30 ≤ MV ≤ 7.00	7
Very influential	0.75 ≤ RII ≤ 0.89	5.25 ≤ MV ≤ 6.29	6
Mostly influential	0.60 ≤ RII ≤ 0.74	4.20 ≤ MV ≤ 5.24	5
Somewhat influential	0.45 ≤ RII ≤ 0.59	3.15 ≤ MV ≤ 4.19	4
Slightly influential	0.30 ≤ RII ≤ 0.44	2.10 ≤ MV ≤ 3.14	3
Neither influential nor uninfluential	0 0.15 ≤ RII ≤ 0.29	1.05 ≤ MV ≤ 2.09	2
Completely uninfluential	0 0.00 ≤ RII ≤ 0.14	0.00 ≤ MV ≤ 1.04	1

Note(s): RII, Relative Importance Index

Table 2.
Decision tool in each round (variable inclusion criteria)

	Preliminary rounds (2nd–3rd)	Final round (4th)
Mean score	Accept: If score (f) ≥ 4.55 (65%)	Accept: If score (f) ≥ 5 (71%)
Standard deviation	Accept: If SD ≤ 2 (2 points away from the mean)	Accept: If SD ≤ 1 (1 point away from the mean)
RII values	Accept: If score (f) ≥ 0.65 (65%)	Accept: If score (f) ≥ 0.71429 (71%)

Note(s): RII, Relative Importance Index; SD, Standard Deviation

In measuring the level of consensus among the panellists when using non-parametric statistical tests, Kendall's W is rated the most recognised rating methodology (Okoli and Pawlowski, 2004). Kendall's W is a consensus benchmark that represents the rate of consensus in a survey among the various contributors (Habibi *et al.*, 2014; Schmidt *et al.*, 2001; Siegel, 1956).

$$\text{Kendall's } W = \frac{12\ S}{m^2(n^3 - n) - mT}$$

$$S = \sum_{i=1}^{n} (R_i - \overline{R})^2$$

R_i = Total rank of a factor

m = number of the raters (judges)

n = number of ranked factors or phenomena (questions being ranked) and

T = the correction factor (only used when there is a tide rank, otherwise = 0

3.1 Demographic analysis

The experts' selection stage is acclaimed to be a crucial aspect towards attaining a successful Delphi survey (Chan *et al.*, 2001). Hence, experts were selected using purposeful sampling with the target population being professionally registered members of Nigerian Institution of Estate Surveyors and Valuers (NIESV). Subsequently, the study adopts a snowball sampling approach which involves a situation where the researchers contacted only two estate surveyors and valuers (ESV) through an introduction by the Kano chapter chairman as suggested by Bryman (2012) who opined that few participants that could refer to additional partakers should be contacted in a snowball sampling. Thereafter, the two ESVs further referred and introduced the researchers to other specialists in office real estate valuation. However, to ascertain their reliability and professional status, the ESVs were cross-checked against NIESV 2020 membership directorate (NIESV, 2020). Thereafter, invitation letters were drafted and sent to the proposed panellist through their email addresses, and subsequently, with the aid of Google form, the survey instrument was administered online through WhatsApp phone numbers of the panellists.

While 18 experts made the proposal list and were issued invitation letters, only 11 responded positively and subsequently served as the panellists. This number was considered adequate as there is no specific process for determining a panel size for any given analysis using the Delphi method (Hallowell and Gambatese, 2010; Williams and Webb, 1994). Therefore, the number of panel members is always decided following the nature and type of study by the respective researchers (Hallowell and Gambatese, 2010). Some scholars, however, suggest less than 10 panellists as appropriate (Strasser *et al.*, 2005), while some suggest 7–15 panellists (Andre *et al.*, 1976), 10–18 (Okoli and Pawlowski, 2004; Lok *et al.*, 2018) and 10–50 panellists (Linstone and Turoff, 1975).

The eleven-member experts that make up the panel are registered members of the professional body (NIESV) and are equally registered with the registration body (ESVARBON). Of these panellists, 46% of them are Fellows, while 54% are in the Associate membership cadre in addition to having at least ten years cognate experience and holding a managerial post or being a principal partner in an estate firm (Table 3).

	Panellist background	*n*	Percentage (%)
Professional affiliation	NIESV	11	100
	ESVARBON	11	100
Membership status	Fellow	5	45.5
	Associate	6	54.5
Sex	Male	8	72.7
	Female	3	27.3
Position held	Principal partners	9	81.8
	Senior partner/head of valuation	1	9.1
Years of experience	Branch manager	1	9.1
	20 years and above	7	63.6
	11–20 years	3	27.3
Sector of practice highest qualification	6–10 years	1	9.1
	Real estate practising firm	11	100
	PhD	1	9.1
	Second degree (MSc, MPhil)	5	45.5
	Postgraduate diploma	2	18.2
	Higher national diploma or first degree	3	27.3

Table 3.
Bio-data of panellists

3.2 Test of concordance and significance of Kendall's W

Rowe and Wright (1999) uphold that attainment of consensus remains the basic aim in a Delphi process; thus Kendall's *W* was considered, at the end of each Delphi round, to assess the level of consensus in the responses gotten from the panel. At the second round, a Kendall's *W* of 0.307 was attained, thereafter a 100% improvement was recorded at the subsequent stage (third round) which recorded 0.616. However, this improvement was still far from the benchmarks of 0.7 as spelt out by Appalasamy *et al.* (2019) and Schmidt (1997), thus signifying a lack of acceptable consensus in the ranking of the variables, and thus, the need for a further Delphi round. At the fourth round, the baseline was attained having recorded Kendall's *W* of 0.742, signalling an end to the survey (see Table 4).

4. Results

During the first round, the panellists identified 24 variables, which were grouped into themes. These themes were compared with the variables obtained from the existing literature and were found to share similarities with most of the 35 established variables in the literature. However, there were eight variables whose traces were not found to directly affect office real estate prices in the literature. These variables comprise the basic amenities involving consistency of both electricity and public water supply in the neighbourhood, construction cost, quality of building construction, the proportion of toilets to office space, waste disposal services including drainages, political stability, occupancy title and conformity with land

Test statistics (n = 11)	Round 2	Round 3	Round 4
Kendall's coefficient of concordance (Kendall's *W*)	0.3071	0.6157358	0.7418
Chi-square	145.2711	196.41972	195.8276
Df	43	29	24
Asymptotic significance (Asymp. Sig.)	5.0652E-13	8.7509E-27	6.6964E-29

Note(s): Table 4 reveals that the asymptotic significance (Asymp. Sig.) of the *p*-values are less than 0.05 per chi-square approximation in all rounds 2 to 4. This indicates that the response is not likely to have arisen by chance (Creswell and Creswell, 2018), hence signifying that the results are statistically significant

Table 4.
Kendall's *W* (at each stage)

zoning. Hence, when these variables were summed with the 35 existing variables in the literature, a total of 44 variables was adopted in the second round.

In the second round, an additional two variables were recommended by the experts that make up the Delphi panel comprising of "level and quality of professional facilities management/services" and "proximity to volatile areas concerning insurgency and riots", and hence, making 46 variables as shown in Table 5.

4.1 Elimination of variables

Following the scrutiny and ranking of these variables by the panellists, which was done in order of significance, some variables were eliminated. During the second round, 16, equivalent to 37%, of the 44 variables had been eliminated where three out of the eight suggested variables were also included. Both "type of occupancy title" (RII = 0.571 and MV = 4.000) and "cleanliness of surroundings" (RII = 0.610 and MV = 4.273) were unable to meet the threshold of RII < 0.65 and MV < 4.55, respectively. "Political stability" on the other hand attained the RII and MV thresholds (RII = 0.701 and MV = 4.909), nevertheless failed the SD assessment as it recorded 2.256, which is greater than 2. However, the experts suggested two other variables at the end of the second round, namely "quality and level of professional facilities management" and "proximity to a volatile area".

At the third round, 30 variables were documented comprising the 28 variables, which were recorded at the second round in addition to the two suggested variables at the end of the second round. However, 17% of these variables were unable to meet the MV and RII threshold of <4.55 and 0.65 respectively and were thus eliminated. Whereas, in terms of SD, only one variable "size of office spaces" recorded an SD of slightly higher than 1 (1.044), and hence, a more stable SD where the majority recorded <0.6.

While the second round recorded as high as 2.378 SD, the third round recorded a relatively stable SD < 1.5 with its peak at 1.044. The stability improved during the fourth round, with 96% of SDs recording ≤0.505 having the variable "size of office spaces" as the highest at 0.522, which coincidentally was the lone variable with the highest SD during the preceding round. The result indicates a stabilised response from the panellists, and hence are within acceptable limits.

Similarly, round 4 recorded the highest RII of 0.961 and had seven variables with RII > 0.9, representing 28% of the variables. Consequently, no further variables were advocated all through the third and fourth rounds. However, only a single variable was unable to meet the MV baseline criteria of 0.5 and was thus eliminated, bringing the total to 48%.

In conclusion, the RII succeeded in aiding the selection of the 24 most influential variables having RII ranging from 0.714 to 0.961 while MV ranged from 5.00 to 6.727 as shown in Table 5. However, 16 of these were rated as the most critical variables having recorded a minimum RII of 0.75 equivalent to MV of 5.25, thus categorised as "extremely influential" and "very influential" variables, where two of these were variables suggested by the experts "proximity to volatile areas" and "quality of construction" both attaining fourth position in rank.

5. Discussion

The variables identified as most influential in this research as shown in Table 5 are categorised into four as follows.

5.1 Property structural attributes

Property structural related attributes had 18 identified variables, thus the highest variables among the four groups. However, the Delphi process ranked eighth of these factors as part of the 16 most influential variables representing 50%. This is in contrast with the study carried

Variables	2nd Round			3rd Round			4th Round			Rank
	Mean	SD	RII	Mean	SD	RII	Mean	SD	RII	
Elasticity, flexibility and adaptability of design (partitioning)	5.091	1.446	0.727	6.273	0.786	0.896	6.727	0.467	0.961	1
Accessibility to the building	5.545	1.635	0.792	6.364	0.505	0.909	6.636	0.505	0.948	2
Size of office spaces (total space provided)	5.455	1.508	0.779	5.909	1.044	0.844	6.545	0.522	0.935	3
Quality of construction of the building	5.091	1.221	0.727	6.000	0.632	0.857	6.364	0.505	0.909	4
Condition of the building (state of repairs)	5.818	1.401	0.831	6.364	0.505	0.909	6.364	0.505	0.909	4
Expected rental growth/capital growth and capitalisation rate	5.364	0.674	0.766	5.455	0.688	0.779	6.364	0.505	0.909	4
Proximity to volatile areas (insurgency and riots)				6.273	0.467	0.896	6.364	0.505	0.909	4
Level of neighbourhood security (crime rate)	5.818	1.250	0.831	6.091	0.539	0.870	6.273	0.467	0.896	8
Gross domestic product (gdp)	4.727	1.489	0.675	5.545	0.522	0.792	6.000	0.000	0.857	9
Quality of the region (situated in a prime and prestigious neighbourhood or otherwise)	6.000	1.000	0.857	5.909	0.701	0.844	5.909	0.302	0.844	10
Proportion of build-up area to land size (% total area of the building)	5.273	1.489	0.753	5.545	0.522	0.805	5.818	0.405	0.831	11
Proportion of rest rooms (toilets) to office space	5.182	1.537	0.740	5.455	0.522	0.792	5.818	0.405	0.831	11
Urban proximity (connectivity and accessibility to CBD)	5.909	0.701	0.844	5.636	0.505	0.818	5.818	0.405	0.831	11
Closeness/distance from highways interchange, transit stations etc.	5.000	0.775	0.714	4.818	0.874	0.714	5.818	0.405	0.831	11
Quality and standard of finishing (floor and wall)	5.273	1.272	0.753	5.727	0.467	0.831	5.727	0.467	0.818	15
Availability, quality and functioning of facilities and services (e.g. lifts, air-conditioning and electricity generation)	5.455	0.522	0.779	5.364	0.505	0.779	5.273	0.467	0.753	16
Vacancy/occupancy rates within the vicinity (average "void" duration in the district)	5.273	0.905	0.753	5.273	0.467	0.766	5.182	0.405	0.740	17
Basic amenities (consistency of public water supply and electricity in the neighbourhood)	5.455	0.934	0.779	5.273	0.467	0.753	5.182	0.405	0.740	17
Office market portfolio and Density of office buildings	5.273	0.905	0.753	5.182	0.603	0.740	5.182	0.405	0.740	17
Building age	4.818	0.982	0.688	5.091	0.539	0.740	5.091	0.302	0.727	20
Social infrastructures and services within the neighbourhood	4.636	0.505	0.662	4.818	0.603	0.688	5.091	0.302	0.727	20
Construction cost	5.273	0.905	0.753	5.182	0.405	0.740	5.091	0.302	0.727	20
Conformity with land Zoning for commercial properties	4.636	1.120	0.662	5.182	0.405	0.753	5.000	0.000	0.714	23
Availability of transportation services	4.818	1.328	0.688	5.000	0.632	0.714	5.000	0.447	0.714	23
Security provision in the building	4.818	0.982	0.688	5.000	0.632	0.727	4.909	0.302	0.701	25
Height of building and number of floors	4.818	0.603	0.688	4.455	0.522	0.636				

Table 5.
Rating of office real estate price determinants by experts

(*continued*)

Quality/level of professional facilities anagement/services				4.455	0.522	0.636				
Panoramic view, ambience and serenity (non-congestive atmosphere)	4.909	1.578	0.714	4.182	0.405	0.597				
Interest/lending rates	4.909	1.044	0.701	4.182	0.405	0.597				
Foreign direct investment (FDI)	4.909	1.136	0.701	4.364	0.505	0.623				
Political stability	4.909	2.256	0.701							
Inflationary trend/rates	4.455	1.572	0.636							
Landscaping, pavements and trees planting beds	4.364	1.804	0.623							
Office sector employment rates	4.364	1.859	0.623							
Exchange rates	4.364	1.286	0.623							
Cleanliness of surroundings (waste disposal services and drainages)	4.273	1.737	0.610							
Availability of financial institutions in the vicinity	4.273	1.794	0.610							
Consumer price index (CPI)	4.273	1.618	0.610							
Liquidity rate (money in circulation and credit spread)	4.182	1.250	0.597							
Operational expenses as regards to; electricity; pipe borne water; waste disposal system and neighbourhood security	4.000	1.095	0.571							
Type of occupancy title (statutory or customary rights)	4.000	2.236	0.571							
Social facilities within the building including restaurant, conference room	4.000	1.000	0.558							
Lifespan of building	3.636	2.378	0.532							
Risk multiplier/premium	3.636	1.748	0.519							
Government bond (stock market indices)	3.455	1.440	0.494							
Population density (demography)	3.273	1.679	0.468							

Table 5.

out by Öven and Pekdemir (2006b) on the determinants of real estate office rents in Istanbul. The study reported that many of the building-related variables used in their study were found not to be influential. However, the findings arising from this study align with Bera and Kangalli Uyar (2019), a study that found that the physical characteristics of real estate have a significant impact on rents.

These eight property-related variables have MV ranging from 5.272 to 6.727 as shown in Table 5 (fourth round). "Flexibility and adaptability of design" ranked the highest having MV of 6.727 and an RII of 0.961 (close to 1). Aitken *et al.* (2020) affirm that real estate designed with easier adaptability features in case the occupants need to make changes tend to be preferable. Likewise, Schilke (2020) observed that office real estate with added flexibility such as the ability to be let to a diverse number of tenants would make it more readily adaptable to a market shift, thus marketable. Furthermore, an increased cost towards making an office real estate flexible and adaptable would eventually lead to higher valued investment. Thus, Poort and Hoo (2008) and Schilke (2020) note that, in the long run, there are positive connotations to flexibility in building projects as it could add value to such projects. Likewise Remøy *et al.* (2011) found that adaptability in an office building only costs 3% higher than the normal cost of construction, but may lead to a higher value in the future.

While adaptability is seen as the ease to physically alter, reconfigure or transform a building (Ross *et al.*, 2016), flexibility is said to determine the use of a building's internal space configuration, thus involving the layout of columns, walls and floor plates, among others (Vimpari *et al.*, 2014). Hence, adaptability is considered to be synonymous with "flexibility" (Rockow *et al.*, 2019).

Concerning the "size of office spaces", while Oyewole and Ajayi (2016) affirm that average floor space was not found to be statistically significant considering office real estate in Nigeria, results from this study indicate a strong positive relationship with an MV of 6.545 and RII of 0.935, which are very close to 1. In line with this study is the study by Ozus (2009) which found that the floor area of rented offices in Istanbul is a significant determinant of office rents. Likewise, Nappi-Choulet *et al.* (2007) affirm that the total surface area of office real estate accounts for almost 60% of the variance in transaction prices of offices in Paris.

The third variable confirmed by this study serves as an extension to existing literature concerning structural attributes having significant impacts on office real estate involving "quality of construction of the building" (RII = 0.909).

5.2 Neighbourhood attributes

The neighbourhood attributes make up the next largest group of variables influencing office real estate. This group consists of 10 identified variables, out of which three variables (19%) were rated as part of the 16 most influential variables. However, out of these three influential variables, "proximity to volatile areas" is one of the variables suggested by the panellists, and hence not found in available literature as regard office real estate pricing. Coincidentally, this particular variable emerges as the most influential in this group with an MV of 6.545 and RII of 0.909. The other two vital variables include "quality of the region" (0.844) and "urban proximity and connectivity cum accessibility to CBD" (0.831).

On a general note, "proximity to volatile areas" may seem the same as "neighbourhood security" as both dwell on security. Conversely, the experts made a distinction between the two stressing that while occupiers and investors yearn for the proximity of police posts close to their buildings to curb criminal activities in the case of "neighbourhood security", most occupiers cum investors demand areas not close to security outposts since such places have become easy targets for insurgents and rioters in the case of "proximity to volatile areas". Similarly, neighbourhood crime may be seen as criminal activities, which may not often lead to loss of property and lives, and consequently may be narrowed to mere thefts and other similar criminal activities. However, volatile areas in terms of riots and insurgencies may experience burning down of properties including loss of lives and maiming (Peterson, 2015).

This leads to the present situation in Nigeria which is battling with the Boko-Haram insurgency with chains of assaults on both property and human lives in the northern parts including the federal capital, holding the country hostage for the past decade as confirmed by Ibrahim and Sabri (2018). Similarly, other non-secular, partisan and socio-economic conflicts relating to the end-SARS alongside el-Zakzaky demonstrations have led to certain areas becoming more volatile than others with adverse effects on investments in such areas.

The Nigerian state of affairs is representative of many African states. Kenya and Somalia face the El-Shabaab insurgency (Jones *et al.*, 2016; Momanyi, 2015) and South Africa battles with xenophobia (Dauda *et al.*, 2018; Ezennia and Mutambara, 2020). Consequently, as the safety of properties, occupants alongside their clients is a key consideration in real estate investments, "proximity to volatile areas" may emerge a vital factor in considering investments in office real estates and hence affecting its price determination in these countries.

5.3 Locational attributes

Locational attributes are seen as the major driving factors concerning real estate pricing generally. Ustaoglu *et al.* (2013) affirm that locational attributes explain the spatial variations in rental value of real estate offices. The results of this survey indicate that three of the four identified variables are significantly influential, thus recording a 75% success. Of these variables, accessibility to the building records the highest MV (6.636) and RII (0.948) in this category, emerging as the second-highest ranked overall. This is in line with the available literature; thus, the results of our study lend some credence to the popular phrase that location advantages raise office price (Chegut *et al.*, 2015; Liang *et al.*, 2018), that is a pivotal point on which real estate activities revolve (Pagourtzi *et al.*, 2003).

Other vital variables according to their ranking include the distance from highway interchange and transit stations (0.831) and urban proximity involving connectivity and accessibility to the CBD (0.831). This is in line with the studies of Murakami and He (2018) who concluded that highway investments influence office real estate prices as a result of better market accessibility within the interchanges. Likewise, Chalermpong and Wattana (2010) found that the proximity to transit stations is closely related to real estate values.

5.4 Macroeconomic attributes

Although macroeconomic attributes identified 14 variables after the panellist's scrutiny, only two (12%) were certified as having significant influence. Hence, expected rental growth serves as the most significant with an RII of 0.909 followed by GDP with 0.857 RII.

Relating expected rental growth to office real estate price, Nwuba (2008) acknowledged that, although the rental growth rate of offices in Abuja did not exceed inflation rates, it followed the same pattern as inflation trends, thus showing a link between inflation as a macroeconomic indicator and real estate prices.

On the other hand, Ng and Higgins (2007) observed that GDP is a major determinant of office properties as investors' confidence is often reposed when an economy is strengthened, thus stimulating alienation of real estate. Likewise, Kiehelä and Falkenbach (2014) affirm that GDP, a demand indicator that exposes the level of economic activities in a nation, serves as an office price determinant because as the economy rises, there is also a boom in demand for office space to satisfy the need for growing businesses and other economic activities. Udoekanem *et al.* (2014, 2015a) concluded that the most significant macroeconomic variable affecting real estate rental growth is the GDP, even though both studies appraised commercial real estates in general rather than office real estate.

6. Conclusion and policy implications

The research, which is geared towards analysing the significant variables affecting office real estate prices in Nigeria, employed the Delphi method in conjunction with the MV cum RII and SD to reduce subjectivity in variable selection. The approach was found to be adequate in ascertaining and handpicking the influencing variables through their relative level of importance as rated by professionals in the field.

The study vetted the 46 variables comprised of variables found in the existing literature and those suggested by the panel of experts practising in Nigeria to cover all variables that may influence office real estate prices. These variables were grouped into themes and subjected to four distinct Delphi rounds comprised of qualitative and quantitative approaches.

Hence, employing acceptability criteria of 5.25 (MV), 0.75 (RII) and an SD $\leq$ 1.00, the study reveals that 16 variables are the most influential price determinants concerning office real estate. Seven of these variables stand out, and hence are the most critical variables, having

recorded RII > 0.9 and MV > 6.36. These include "flexibility and adaptability of design" (MV = 6.727 and RII = 0.961) and "accessibility to the building" (MV = 6.36 and RII = 0.9148). Others include "size of office spaces" (MV = 6.545 and RII = 0.935); "quality of construction of the building" (MV = 6.364 and RII = 0.909); "condition of the building" (MV = 6.364 and RII = 0.909); "expected rental growth/capital growth and capitalisation rate" (MV = 6.364 and RII = 0.909) and "proximity to volatile areas" (MV = 6.364 and RII = 0.909).

Conclusively, the outcome of this research, which is the first study to adopt the Delphi technique cum RII in exploring office real estate pricing in Nigeria, advances previous attempts at identifying the significant price-determining variables regarding office real estate. Thus, the study extends the existing literature by adding three variables including "the volatility level of the area", "the proportion of restrooms to office space" and "quality of construction of the building" to the existing literature as substantial variables not previously identified concerning office real estate pricing. Consequently, this study, which provides significant findings on critical factors required for objective modelling of the Nigerian office real estate market, offers some practical implications. First, it will aid practitioners' and investors' resolutions towards circumventing volatile areas. Second, the practical application of these variables in modelling office real estate will improve the quality of data available to ESVs and thereby enhancing his/her valuation competency and leading to the fortification of the valuers' credibility and integrity. Third, with the growing trend in the application of AI in price prediction, the real estate regulatory body in Nigeria, NIESV, can adopt the findings of this study in creating a central repository for real estate price determinants in northern Nigeria. These will create an enhanced policy implication towards sustainable investment decisions in land and landed properties.

7. Future research

Being part of research on office price modelling using AI, this study was only anticipated to serve as an identification criterion for determining the critical variables adoptable in the proposed pricing model. However, it is necessary to view the generalisation ability of these chosen variables through an exposure of the variables to a wider range of professionals in the field.

References

Abidoye, R.B. and Chan, A.P.C. (2016), "Critical determinants of residential property value: professionals' perspective", *Journal of Facilities Management*, Vol. 14 No. 3, pp. 283-300, doi: 10.1108/JFM-02-2016-0003.

Abidoye, R.B. and Chan, A.P.C. (2017), "Modelling property values in Nigeria using artificial neural network", *Journal of Property Research*, Vol. 34 No. 1, pp. 36-53, doi: 10.1080/09599916.2017.1286366.

Adair, A., Berry, J. and McGreal, S. (1996), "Valuation of residential property: analysis of participant behaviour", *Journal of Property Valuation and Investment*, Vol. 14 No. 1, pp. 20-35, doi: 10.1108/14635789610107453.

Adegoke, O.J. (2016), "Effects of valuation variance and inaccuracy on Nigerian commercial property market: an empirical study", *Journal of Property Investment and Finance*, Vol. 34 No. 3, pp. 276-292, doi: 10.1108/JPIF-08-2014-0056.

Aghili, N., Hosseini, S.E., Bin Mohammed, A.H. and Zainul Abidin, N. (2019), "Management criteria for green building in Malaysia; relative important index", *Energy Sources, Part A: Recovery, Utilization and Environmental Effects*, Vol. 41 No. 21, pp. 2601-2615, doi: 10.1080/15567036.2019.1568634.

Aitken, D., Gilroy, R. and Willis, K. (2020), "A home for life or a home for now? Understanding indifference toward accessibility and adaptability features among some older homebuyers", *Journal of Aging and Environment*, Vol. 34 No. 4, pp. 417-434, doi: 10.1080/26892618.2019.1707739.

Andre, L., De Ven, V., Andrew, H. and David, H. (1976), "Group techniques for program planning: a guide to nominal group and Delphi processes", *The Journal of Applied Behavioral Science*, Vol. 12 No. 4, p. 581, doi: 10.1177/002188637601200414.

Appalasamy, J.R., Joseph, J.P., Ramaiah, S.S., Quek, K.F., Zain, A.Z.M. and Tha, K.K. (2019), "An intervention to promote medication understanding and use self-efficacy: design of video narratives for aging patients at risk of recurrent stroke", *JMIR Aging*, Vol. 2 No. 1, doi: 10.2196/11539.

Bello, M.O. and Bello, V.A. (2007), "The influence of consumers behavior on the variables determining residential property values in Lagos, Nigeria", *American Journal of Applied Sciences*, Vol. 4 No. 10, pp. 774-778, doi: 10.3844/ajassp.2007.774.778.

Beltratti, A. and Morana, C. (2010), "International house prices and macroeconomic fluctuations", *Journal of Banking and Finance*, Vol. 34 No. 3, pp. 533-545, doi: 10.1016/j.jbankfin.2009.08.020.

Bera, A.K. and Kangalli Uyar, S.G. (2019), "Local and global determinants of office rents in Istanbul: the mixed geographically weighted regression approach", *Journal of European Real Estate Research*, Vol. 12 No. 2, pp. 227-249, doi: 10.1108/JERER-12-2018-0052.

Berawi, M.A., Suwartha, N., Salsabila, F., GunawanMiraj, P. and Woodhead, R. (2019), "Land value capture modeling in commercial and office areas using a big data approach", *International Journal of Technology*, Vol. 10 No. 6, pp. 1150-1156, doi: 10.14716/ijtech.v10i6.3640.

Bin, J., Gardiner, B., Liu, Z. and Li, E. (2019), "Attention-based multi-modal fusion for improved real estate appraisal: a case study in Los Angeles", *Multimedia Tools and Applications*, Vol. 78 No. 22, pp. 31163-31184, doi: 10.1007/s11042-019-07895-5.

Binoy, B., Naseer, M. and Anil Kumar, P. (2020), "A methodology for identifying critical factors influencing land value in urban areas: a case study of Kerala, India", *Property Management*, Vol. 38 No. 5, pp. 665-681, doi: 10.1108/PM-01-2020-0004.

Brady, S.R. (2015), "Utilizing and adapting the Delphi method for use in qualitative research", *International Journal of Qualitative Methods*, Vol. 14 No. 5, doi: 10.1177/1609406915621381.

Bryman, A. (2012), *Social Research Methods*, 4th ed., Oxford University Press.

Chalermpong, S. and Wattana, K. (2010), "Rent capitalization of access to rail transit stations: spatial hedonic models of office rent in Bangkok", *Journal of the Eastern Asia Society for Transportation Studies*, Vol. 8, pp. 926-940.

Chan, A.P.C., Yung, E.H.K., Lam, P.T.I., Tam, C.M. and Cheung, S.O. (2001), "Application of Delphi method in selection of procurement systems for construction projects", *Construction Management and Economics*, Vol. 19 No. 7, pp. 699-718, doi: 10.1080/01446190110066128.

Chegut, A.M., Eichholtz, P.M.A. and Rodrigues, P.J.M. (2015), "Spatial dependence in international office markets", *Journal of Real Estate Finance and Economics*, Vol. 51 No. 2, pp. 317-350, doi: 10.1007/s11146-014-9484-x.

Chiarazzo, V., Caggiani, L., Marinelli, M. and Ottomanelli, M. (2014), "A neural network based model for real estate price estimation considering environmental quality of property location", *Transportation Research Procedia*, Vol. 3, July, pp. 810-817, doi: 10.1016/j.trpro.2014.10.067.

Clark, S.D. and Lomax, N. (2018), "A mass-market appraisal of the English housing rental market using a diverse range of modelling techniques", *Journal of Big Data*, Vol. 5 No. 1, doi: 10.1186/s40537-018-0154-3.

Crawford, G.W. and Fratantoni, M.C. (2003), "Assessing the forecasting performance of regime-switching, ARIMA and GARCH models of house prices", *Real Estate Economics*, Vol. 31 No. 2, pp. 223-243, doi: 10.1111/1540-6229.00064.

Creswell, J.W. and Creswell, J.D. (2018), *Research Design; Qualitative, Quantitative, and Mixed Methods Approaches*, 5th ed., Salmon, H., O'Heffernan, M., Felts, D.C. and Marks, A. (Eds), SAGE Publications, London.

Dauda, M., Sakariyau, R.T. and Ameen, A. (2018), "Xenophobic violence in South Africa and the Nigerians' victimization: an empirical analysis", *Pertanika Journal of Social Sciences and Humanities*, Vol. 26 No. 4, pp. 2677-2700.

Del Giudice, V., De Paola, P., Forte, F. and Manganelli, B. (2017), "Real estate appraisals with Bayesian approach and Markov chain hybrid Monte Carlo method: an application to a central urban area of Naples", *Sustainability (Switzerland)*, Vol. 9 No. 11, doi: 10.3390/su9112138.

Dey, S.K. and Urolagin, S. (2021), "Real estate price prediction using data mining techniques", *2021 IEEE 4th International Conference on Computing, Power and Communication Technologies, GUCON 2021*, pp. 26-29, doi: 10.1109/GUCON50781.2021.9573829.

Dunse, N., Leishman, C. and Watkins, C. (2002), "Testing for the existence of office sub-markets: a comparison of evidence from two cities", *Urban Studies*, Vol. 39 No. 3, pp. 483-506, doi: 10.1080/00420980220112793.

Dunse, N., Jones, C. and White, M. (2010), "Valuation accuracy and spatial variations in the efficiency of the property market", *Journal of European Real Estate Research*, Vol. 3 No. 1, pp. 24-45, doi: 10.1108/17539261011040523.

Egbenta, I.R., Uchegbu, S.N., Ubani, E. and Akalemeaku, O.J. (2021), "Effects of noise pollution on residential property value in Enugu urban, Nigeria", *SAGE Open*, Vol. 11 No. 3, doi: 10.1177/21582440211032167.

Ezennia, J.C. and Mutambara, E. (2020), "Sociological factors influencing the success of African immigrant-owned micro businesses in South Africa", *Entrepreneurship and Sustainability Issues*, Vol. 8 No. 1, pp. 972-982, doi: 10.9770/jesi.2020.8.1(65.

Eziukwu, N.A. (2019), "Valuation inaccuracy: implication on commercial property investment performance in Akure, Nigeria", *Journal of African Real Estate Research*, Vol. 4 No. 1, doi: 10.15641/jarer.v0i0.712.

Farooq, B., Miller, E.J. and Haider, M. (2010), "Hedonic analysis of office space rent", *Transportation Research Record*, Vol. 2174, pp. 118-127, doi: 10.3141/2174-16.

Gani, A.A., Awang, K.W., Mohamad, A. and Samdin, Z. (2015), "Attributes of successful public participation in planning for sustainable tourism in protected areas: a modified Delphi study", *Pertanika Journal of Social Science and Humanities*, Vol. 23, January, pp. 49-64.

Gardiner, C. and Henneberry, J. (1989), "The development of a simple regional office rent prediction model", *Journal of Valuation*, Vol. 7 No. 1, pp. 36-52, doi: 10.1108/eum0000000003257.

Ge, C., Wang, Y., Xie, X., Liu, H. and Zhou, Z. (2019), "An integrated model for urban subregion house price forecasting: a multi-source data perspective", *Proceedings - IEEE International Conference on Data Mining, ICDM, 2019 November (ICDM)*, pp. 1054-1059, doi: 10.1109/ICDM.2019.00123.

Gelos, R.G. and Wei, S.-J. (2002), "Transparency and international investors behaviour", WP/02/174; IMF Working Paper, available at: http://users.nber.org/~wei/data/gelos&wei2002/gelos&wei2002.pdf.

Giussani, B., Hsia, M. and Tsolacos, S. (1993), "A comparative analysis of the major determinants of office rental values in Europe", *Journal of Property Valuation and Investment*, Vol. 11 No. 2, pp. 157-173, doi: 10.1108/14635789310031487.

Gough, D. (2015), "Qualitative and mixed methods in systematic reviews", *Systematic Reviews*, Vol. 4 No. 1, pp. 1-3, doi: 10.1186/s13643-015-0151-y.

Granziera, E. and Kozicki, S. (2015), "House price dynamics: fundamentals and expectations", *Journal of Economic Dynamics and Control*, Vol. 60, pp. 152-165, doi: 10.1016/j.jedc.2015.09.003.

Grissom, T.V. and Diaz, J. (1991), "Valuation without comparables", *The Appraisal Journal*, Vol. 59 No. 3, pp. 370-376.

Guijarro, F. (2021), "A mean-variance optimization approach for residential real estate valuation", *Real Estate Management and Valuation*, Vol. 29 No. 3, pp. 13-28, doi: 10.2478/remav-2021-0018.

Habibi, A., Sarafrazi, A. and Izadyar, S. (2014), "Delphi technique theoretical framework in qualitative research", *The International Journal of Engineering and Science*, pp. 8-13.

Hallowell, M.R. and Gambatese, J.A. (2010), "Qualitative research: application of the Delphi method to CEM research", *Journal of Construction Engineering and Management*, Vol. 136 No. 1, pp. 99-107, doi: 10.1061/(asce)co.1943-7862.0000137.

Hasson, F., Keeney, S. and McKenna, H. (2000), "Research guidelines for the Delphi survey technique", *Journal of Advanced Nursing*, Vol. 32 No. 4, pp. 1008-1015, doi: 10.1046/j.1365-2648.2000.t01-1-01567.x.

Hong, J., Choi, H. and Kim, W.S. (2020), "A house price valuation based on the random forest approach: the mass appraisal of residential property in South Korea", *International Journal of Strategic Property Management*, Vol. 24 No. 3, pp. 140-152, doi: 10.3846/ijspm.2020.11544.

Hoptroff, R.G. (1993), "The principles and practice of time series forecasting and business modelling using neural nets", *Neural Computing and Applications*, Vol. 1 No. 1, pp. 59-66.

Hu, L., He, S., Han, Z., Xiao, H., Su, S., Weng, M. and Cai, Z. (2019), "Monitoring housing rental prices based on social media: an integrated approach of machine-learning algorithms and hedonic modeling to inform equitable housing policies", *Land Use Policy*, Vol. 82 No. 129, pp. 657-673, doi: 10.1016/j.landusepol.2018.12.030.

Ibrahim, S. and Sabri, A.Z.S.A. (2018), "Historical overview of terrorism and its effect on the Nigerian economy in the 21st century", *Journal of Engineering and Applied Sciences*, Vol. 13, pp. 5328-5333, doi: 10.3923/jeasci.2018.5328.5333.

Iroham, C.O., Oluwuwnmi, A.O., Simon, R.F. and Akerele, B.A. (2013), "Assessing the trend in rental values of commercial properties along Oyemekun Road Akure, Nigeria", *International Journal of Sustainable Land Use and Urban Planning*, Vol. 1 No. 2, pp. 32-45, doi: 10.24102/ijslup.v1i2.380.

Ja'afar, N.S., Mohamad, J. and Ismail, S. (2021), "Machine learning for property price prediction and price valuation: a systematic literature review", *Planning Malaysia*, Vol. 19 No. 3, pp. 411-422, doi: 10.21837/PM.V19I17.1018.

Jian-Jiun, C., Kuentai, C. and Ping-Yu, C. (2012), "Pricing and analyzing the pre-owned house in Taipei City with fuzzy variables", *Journal of Quality*, Vol. 19 No. 4, pp. 349-372, doi: 10.6220/joq.2012.19(4).04.

Johnson, J.W. and LeBreton, J.M. (2004), "History and use of relative importance indices in organizational research", *Organizational Research Methods*, Vol. 7 No. 3, pp. 238-257, doi: 10.1177/1094428104266510.

Jones, S.G., Liepman, A.M. and Chandler, N. (2016), *Counterterrorism and Counterinsurgency in Somalia: Assessing the Campaign Against Al Shabaab*, RAND Corporation, Santa Monica, California, doi: 10.4324/9780429031038-16.

Kabaivanov, S. and Markovska, V. (2021), "Artificial intelligence in real estate market analysis", *AIP Conference Proceedings*, Vol. 2333, March, doi: 10.1063/5.0041806.

Kangallı Uyar, S. (2020), "The matrix exponential spatial specification approach for big datasets: the analysis of Istanbul office market", *Sosyoekonomi*, Vol. 28 No. 1059, pp. 65-87, doi: 10.17233/sosyoekonomi.2020.01.04.

Kempf, S. (2016), "Development of hedonic office rent indices: examples for German metropolitan areas", in Thomas, M. and Rottke, N.B. (Eds), *Essays in Real Estate Research*, Immobolien Manager Verlag, Cologne, p. 371.

Khodyakov, D., Grant, S., Barber, C.E.H., Marshall, D.A., Esdaile, J.M. and Lacaille, D. (2017), "Acceptability of an online modified Delphi panel approach for developing health services performance measures: results from 3 panels on arthritis research", *Journal of Evaluation in Clinical Practice*, Vol. 23 No. 2, pp. 354-360, doi: 10.1111/jep.12623.

Kiehelä, S. and Falkenbach, H. (2014), "Modelling and forecasting central Helsinki office rents", *International Journal of Strategic Property Management*, Vol. 18 No. 3, pp. 292-306, doi: 10.3846/1648715X.2014.942720.

Kim, L. (2004), "Time-varying macroeconomic risk and commercial real estate: an asset pricing perspective", *Journal of Real Estate Portfolio Management*, Vol. 10 No. 1, pp. 47-57, doi: 10.1080/10835547.2004.12089695.

Kim, C.H. and Yeo, K. (2018), "Beyond consensus: a review of Delphi research published in Malaysian social science journals", *International Journal of Business and Society*, Vol. 19 No. S2, pp. 312-323.

Kołodziejczyk, B., Osiichuk, D. and Mielcarz, P. (2020), "Quantification of financial consequences of buildings' ageing: analysis of panel building-level data from the Polish office space market", *Property Management*, Vol. 39 No. 2, pp. 227-249, doi: 10.1108/PM-07-2020-0045.

Kopczewska, K. and Lewandowska, A. (2018), "The price for subway access: spatial econometric modelling of office rental rates in London", *Urban Geography*, Vol. 39 No. 10, pp. 1528-1554, doi: 10.1080/02723638.2018.1481601.

Lam, P.T.I., Wong, F.K.W. and Wong, F.W.H. (2007), "Building features and site-specific factors affecting buildability in Hong Kong", *Journal of Engineering, Design and Technology*, Vol. 5 No. 2, pp. 129-147, doi: 10.1108/17260530710833185.

Lam, K.C., Yu, C.Y. and Lam, C.K. (2009), "Support vector machine and entropy based decision support system for property valuation", *Journal of Property Research*, Vol. 26 No. 3, pp. 213-233, doi: 10.1080/09599911003669674.

Li, J. and Chen, X. (2015), "Analysis of China's real estate prices and macroeconomy based on evolutionary co-spectral method", *Journal of Industrial Engineering and Management*, Vol. 8 No. 2, pp. 598-614, doi: 10.3926/jiem.1419.

Liang, J., Reed, R. and Crabb, T. (2018), "The contribution of spatial dependency to office building price indexes: a Melbourne case study", *Journal of Property Investment and Finance*, Vol. 36 No. 3, pp. 232-247, doi: 10.1108/JPIF-03-2017-0021.

Lim, L.C., McGreal, S. and Webb, J.R. (2006), "Perception of real estate investment opportunities in Central/South America and Africa", *Journal of Real Estate Portfolio Management*, Vol. 12 No. 3, pp. 261-276, doi: 10.1080/10835547.2006.12089743.

Linstone, H.A. and Turoff, M. (1975), "The Delphi method: techniques and applications", *Journal of Marketing Research*, Vol. 13 No. 3, p. 317, doi: 10.2307/3150755.

Lok, K.L., Opoku, A. and Baldry, D. (2018), "Design of sustainable outsourcing services for facilities management: critical success factors", *Sustainability (Switzerland)*, Vol. 10 No. 7, pp. 1-15, doi: 10.3390/su10072292.

Ludwig, B.G. (1994), "Internationalizing extension: an exploration of the characteristics evident in a state university Extension system that achieves internationalization", A PhD thesis, The Ohio State University.

Momanyi, S.M. (2015), "The impact of Al-Shabab terrorist attacks in Kenya [December, The Arctic University of Norway (UiT Norges arktiske universitet)]", available at: https://oarklibrary.com/file/2/2b1ce142-9ef7-456b-9066-5c6105f9f734/ceae6045-550b-4eae-b9d4-03953ab881ee.pdf.

Murakami, J. and He, Y. (2018), "Highway investment in deindustrialization: a territorial analysis of office property transactions in Hong Kong, 2002–2013", *Journal of Transport Geography*, Vol. 66, August 2017, pp. 200-212, doi: 10.1016/j.jtrangeo.2017.12.002.

Nappi-Choulet, I.P. and Maury, T.P. (2009), "A spatiotemporal autoregressive price index for the Paris office property market", *Real Estate Economics*, Vol. 37 No. 2, pp. 305-340, doi: 10.1111/j.1540-6229.2009.00244.x.

Nappi-Choulet, I., Maleyre, I. and Maury, T.P. (2007), "A hedonic model of office prices in Paris and its immediate suburbs", *Journal of Property Research*, Vol. 24 No. 3, pp. 241-263, doi: 10.1080/09599910701599290.

Ng, B.F. and Higgins, D. (2007), "Modelling the commercial property market: an empirical study of the Singapore office market", *Pacific Rim Property Research Journal*, Vol. 13 No. 2, pp. 176-193, doi: 10.1080/14445921.2007.11104229.

NIESV (2020), *Financial Members List*, Nigerian Institution of Estate Surveyors and Valuers, available at: https://niesv.org.ng/financial_list.php.

Nwuba, C.C. (2008), "Analysis of office rents movements in Abuja, Nigeria", *The Estate Surveyor and Valuer*, Vol. 27 No. 1, pp. 64-71.

Ojetunde, I. (2014), "Revisiting the interaction between the Nigerian residential property market and the macroeconomy", *SSRN Electronic Journal*, 2394700, doi: 10.2139/ssrn.2394700.

Okoli, C. and Pawlowski, S.D. (2004), "The Delphi method as a research tool: an example, design considerations and applications", *Information and Management*, Vol. 42 No. 1, pp. 15-29, doi: 10.1016/j.im.2003.11.002.

Oloke, O., Jesusegun, D., Alagbe, O. and Akindele, A. (2021), "Comparing residential property values in border towns of Lagos Megacity, Nigeria", *Journal of South African Business Research*, 146557, doi: 10.5171/2021.146557.

Olszewski, K., Decyk, P., Gałaszewska, K., Jakubowski, A., Kulig, M., Modzelewska, R. and Żywiecka, H. (2018), "Hedonic analysis of office and retail rents in three major cities in Poland", in Naukowa, R., Łaszek, J., Olszewski, K. and Sobiecki, R. (Eds), *Recent Trends in the Real Estate Market and its Analysis (First)*, SGH Publishing House, pp. 383-391.

Öven, V.A. and Pekdemir, D. (2006a), "Office rent determinants utilising factor analysis-a case study for İstanbul", *Journal of Real Estate Finance and Economics*, Vol. 33 No. 1, pp. 51-73, doi: 10.1007/s11146-006-8274-5.

Öven, V.A. and Pekdemir, D. (2006b), "Perceptions of office rent determinants by real estate brokerage firms in Istanbul", *European Planning Studies*, Vol. 14 No. 4, pp. 557-576, doi: 10.1080/09654310500421246.

Oyewole, M.O. and Ajayi, C.A. (2014), "Influence of macro-economic factors on the performance of office properties in Lagos, Nigeria", *Journal of Property Research and Construction*, Vol. 2 No. 1, pp. 40-48.

Oyewole, M.O. and Ajayi, C.A. (2016), "Influence of physical characteristics on the performance of office properties in Lagos, Nigeria", *Civil and Environmental Research*, Vol. 8 No. 5, pp. 140-148.

Ozus, E. (2009), "Determinants of office rents in the Istanbul metropolitan area", *European Planning Studies*, Vol. 17 No. 4, pp. 621-633, doi: 10.1080/09654310902811598.

Pagourtzi, E., Assimakopoulos, V., Hatzichristos, T. and French, N. (2003), "Real estate appraisal: a review of valuation methods", *Journal of Property Investment and Finance*, Vol. 21 No. 4, pp. 383-401, doi: 10.1108/14635780310483656.

Pagourtzi, E., Metaxiotis, K., Nikolopoulos, K., Giannelos, K. and Assimakopoulos, V. (2007), "Real estate valuation with artificial intelligence approaches", *International Journal of Intelligent Systems Technologies and Applications*, Vol. 2 No. 1, pp. 50-57.

Peterson, A. (2015), "Social protest", *International Encyclopedia of the Social & Behavioral Sciences*, Vol. 22, 2nd ed., Elsevier, doi: 10.1016/B978-0-08-097086-8.96024-0.

Pivo, G. (2008), "Responsible property investment criteria developed using the Delphi method", *Building Research and Information*, Vol. 36 No. 1, pp. 20-36, doi: 10.1080/09613210701574795.

Poort, J.P. and Hoo, J. (2008), "Assessing the value of flexibility in the Dutch office sector using real option analysis", *2008 1st International Conference on Infrastructure Systems and Services: Building Networks for a Brighter Future, INFRA 2008*, doi: 10.1109/INFRA.2008.5439619.

Pow, N., Janulewicz, E. and Liu, L. (Dave) (2014), "Applied machine learning project 4 prediction of real estate property prices in Montreal" in *Course Project, COMP-598, Fall/2014*, McGill University, pp. 1-8.

Radonjić, M., Durišic, V., Rogic, S. and Durovic, A. (2019), "The impact of macroeconomic factors on income inequality: evidence from the Montenegro", *Ekonomski Pregled*, Vol. 70 No. 4, pp. 603-626, doi: 10.32910/ep.70.4.2.

Razali, M.N. (2015), "The dynamic of returns and volatility of Malaysian listed property companies in Asian property market", *International Journal of Strategic Property Management*, Vol. 19 No. 1, pp. 66-83, doi: 10.3846/1648715X.2015.1004656.

Remøy, H., de Jong, P. and Schenk, W. (2011), "Adaptable office buildings", *Property Management*, Vol. 29 No. 5, pp. 443-453, doi: 10.1108/02637471111178128.

Rockow, Z.R., Ross, B. and Black, A.K. (2019), "Review of methods for evaluating adaptability of buildings", *International Journal of Building Pathology and Adaptation*, Vol. 37 No. 3, pp. 273-287, doi: 10.1108/IJBPA-01-2018-0013.

Rosen, K.T. (1984), "Toward a model of the office building sector", *AREUEA Journal*, Vol. 12 No. 3, p. 9.

Ross, B.E., Chen, D.A., Conejos, S. and Khademi, A. (2016), "Enabling adaptable buildings: results of a preliminary expert survey", *Procedia Engineering*, Vol. 145, pp. 420-427, doi: 10.1016/j.proeng.2016.04.009.

Rossini, P. (1997), "Application of artificial neural networks to the valuation of residential property", *Third Annual Pacific-Rim Real Estate Society Conference*, Palmerston, New Zealand, pp. 1-9.

Rowe, G. and Wright, G. (1999), "The Delphi technique as a forecasting tool: issues and analysis", *International Journal of Forecasting*, Vol. 15 No. 4, pp. 353-375, doi: 10.1016/S0169-2070(99)00018-7.

Roy, R., Chan, N.W. and Ahmed, Q.N. (2014), "A Delphi study to determine sustainability factors: the case of rice farming in Bangladesh", *Journal of Sustainability Science and Management*, Vol. 9 No. 1, pp. 56-68.

Sanderson, D. (2015), "Determinants of satisfaction amongst occupiers of commercial property", *Proceedings: ERES2015*, pp. 149-170, doi: 10.15396/eres2015_86.

Schilke, M.N. (2020), "Exploring financial decisions in Swedish Commercial real estate; how the question of added flexibility in the real estate product is handled in practice", Royal Institute of Technology.

Schmidt, R.C. (1997), "Managing Delphi surveys using nonparametric statistical techniques", *Decision Sciences*, Vol. 28 No. 3, pp. 763-774, doi: 10.1111/j.1540-5915.1997.tb01330.x.

Schmidt, R., Lyytinen, K., Keil, M. and Cule, P. (2001), "Identifying software project risks: an international Delphi study", *Journal of Management Information Systems*, Vol. 17 No. 4, pp. 5-36, doi: 10.1080/07421222.2001.11045662.

Selim, H. (2009), "Determinants of house prices in Turkey: hedonic regression versus artificial neural network", *Expert Systems with Applications*, Vol. 36 No. 2 PART 2, pp. 2843-2852, doi: 10.1016/j.eswa.2008.01.044.

Siegel, S. (1956), *Nonparametric Statistics for the Behavioral Sciences*, 1st ed., McGraw-Hill. doi: 10.4135/9781412961288.n273.

Sing, T.F., Yang, J.J. and Yu, S.M. (2021), "Boosted tree ensembles for artificial intelligence based automated valuation models (AI-AVM)", *The Journal of Real Estate Finance and Economics*, 5 November, pp. 1-26, 0123456789, doi: 10.1007/s11146-021-09861-1.

Smythe, T., Wainwright, A., Foster, A. and Lavy, C. (2017), "What is a good result after clubfoot treatment? A Delphi-based consensus on success by regional clubfoot trainers from across Africa", *PLoS ONE*, Vol. 12 No. 12, pp. 1-9, doi: 10.1371/journal.pone.0190056.

Strasser, S., London, L. and Kortenbout, E. (2005), "Developing a competence framework and evaluation tool for primary care nursing in South Africa", *Education for Health*, Vol. 18 No. 2, pp. 133-144, doi: 10.1080/13576280500145615.

Tse-Hsiung, L. and Perng, Y.H. (2019), "Key factors affecting the rent of office buildings: case study on Taipei 101", *IOP Conference Series: Materials Science and Engineering*, Vol. 652 No. 1, doi: 10.1088/1757-899X/652/1/012066.

Udoekanem, N.B., Ighalo, J.I. and Nuhu, M.B. (2014), "Determinants of commercial property rental growth in Minna, Nigeria", *EUL Journal of Social Sciences (V:I) LAÜ Sosyal Bilimler Dergisi*, Vol. 5 No. 1, pp. 60-75.

Udoekanem, N.B., Ighalo, J.I. and Nuhu, M.B. (2015a), "Office rental dynamics in Minna, Nigeria", *Sri Lankan Journal of Real Estate*, Department of Estate Management and Valuation University of Sri Jayewardenepura, Vol. 17, pp. 16-30.

Udoekanem, N.B., Ighalo, J.I., Sanusi, Y.A. and Nuhu, M.B. (2015b), "Office rental determinants in Wuse commercial district of Abuja, Nigeria", *University of Mauritius Research Journal*, Vol. 21, pp. 2001-2012.

Ustaoğlu, E. (2003), "Hedonic price analysis of office rents: a case study of the office market in Ankara", *A Thesis Submitted to the Graduate School (Issue September)*, Middle East Technical University.

Ustaoglu, E., Türel, A. and Güzel, A. (2013), "Evaluating the functional utility characteristics of office buildings: a case study of the office market in Ankara, Turkey", *Journal of Real Estate Literature*, Vol. 21 No. 1, pp. 79-103.

Valier, A. and Micelli, E. (2020), "Automated models for value prediction: a critical review of the debate", *Valori e Valutazioni*, Vol. 2020 No. 24, pp. 151-162.

van de Minne, A., Francke, M. and Geltner, D. (2021), "Forecasting US commercial property price indexes using dynamic factor models", *Journal of Real Estate Research*, Vol. 0 No. 0, pp. 1-27, doi: 10.1080/08965803.2020.1840802.

Vimpari, J., Kajander, J.K. and Junnila, S. (2014), "Valuing flexibility in a retrofit investment", *Journal of Corporate Real Estate*, Vol. 16 No. 1, pp. 3-21, doi: 10.1108/JCRE-07-2013-0017.

Wan Rodi, W.N., Che-Ani, A.I., Tawil, N.M., Ting, K.H. and Aziz, F. (2019), "The driving factors to rental depreciation of purpose-built office (PBO) buildings: a PLS-SEM approach", *Journal of Facilities Management*, Vol. 17 No. 1, pp. 107-120, doi: 10.1108/JFM-11-2017-0073.

Williams, P.L. and Webb, C. (1994), "The Delphi technique: a methodological discussion", *Journal of Advanced Nursing*, Vol. 19 No. 1, pp. 180-186, doi: 10.1111/j.1365-2648.1994.tb01066.x.

Wyatt, P. (2013), "Property valuation", *Property Valuation*, 2nd ed., Wiley-Blackwell, doi: 10.4324/9781315797700.

Yacim, J.A. and Boshoff, D.G.B. (2014), "Mass appraisal of properties appropriateness of models", *Virtual Multidisciplinary Conference QUAESTI*, December, 15-19, pp. 182-193.

Yalpir, S. (2014), "Forecasting Residential real estate values with AHP method and integrated GIS", *Conference Proceedings of People, Buildings and Environment, an International Scientific Conference*, pp. 694-706.

Yan, Y., Wei, X., Hui, B., Yang, S., Wen, Z., Hong, Y. and Shou-yang, W. (2007), "Method for housing price forecasting based on TEI @ I methodology", *Systems Engineering – Theory and Practice*, Vol. 27 No. 7, pp. 1-9, doi: 10.1016/S1874-8651(08)60047-2.

Zawir Simon, Z., Achsani, N.A., Manurung, A.H. and Sembel, R. (2015), "The determinants of rental rates and selling prices of office spaces in Jakarta: a macroeconometric model using VECM approach", *International Journal of Economics and Finance*, Vol. 7 No. 3, pp. 165-178, doi: 10.5539/ijef.v7n3p165.

Corresponding author
AbdurRaheem A. Yakub can be contacted at: aayakubam@gmail.com