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GEOGRAPHIC INFORMATION SYSTEMS (GIS) AND REAL ESTATE PRACTICE: ESTATE SURVEYING AND VALUATION FIRMS' PERSPECTIVE

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Abstract

This study investigates the awareness, utilisation, and impact of Geographic Information Systems in the real estate services offered by estate surveying and valuation firms in Akure, Nigeria. The purpose is to bridge the gap between GIS awareness and practical implementation among real estate professionals, providing valuable insights for industry stakeholders, policymakers, and researchers. The study focuses on Akure, the capital city of Ondo State, employing census sampling to obtain data from 26 estate surveying and valuation firms. We used a structured questionnaire to gather information on the awareness of GIS, its utilisation in service provision, and the perceived impact on overall service quality. Frequency distribution, weighted mean score, and Spearman's rank correlation were employed to analyse the data. Findings reveal a remarkable awareness of GIS among estate surveyors and valuers, but a significant gap exists between understanding and practical implementation. While respondents demonstrated a positive correlation between GIS and estate services, the actual utilisation of GIS in practice was lower than anticipated. Specific areas, like real estate marketing, showed higher GIS integration than property management and land use charge administration. This research contributes to the existing body of knowledge by shedding light on GIS utilisation in the real estate sector in Akure, Nigeria. The study emphasises the need for increased awareness, training programmes, and collaborative initiatives to enhance the practical integration of GIS in real estate services. The findings hold significance for industry practitioners, policymakers, and researchers aiming to promote the effective use of GIS in the dynamic landscape of estate surveying and valuation.

Keywords: Estate Surveying, Geographic Information System, Real Estate Practice, Valuation firms

INTRODUCTION

A Geographic Information System is a crucial computerised database management system that involves recording, storing, retrieving, analyzing, and visualizing location data using spatial or geographic coordinates (Ron, Prill, & Elaine, 2001). In the real estate industry, GIS holds particular significance due to the pivotal role of location in property-related decision-making

(Anselin, 1998). Nigerian real estate professionals engage in diverse services such as estate agency, property management, land administration, and property assessment, all of which stand to benefit from the improved data availability and analytical tools provided by GIS (Otegbulu, Ukpong, & Umeh, 2015).

GIS is a critical analytical platform for spatial planning and decision-making within the real estate sector (Leeuw et al., 2010). Its spatial analysis capabilities are invaluable for mapping real estate markets and aiding professionals in property search, advertising, investment decisions, and route analysis (Clapp & Rodriguez, 1998; Otegbulu et al., 2015). The system facilitates visual analysis of property characteristics, enabling geographical querying and geocoding and empowering consumers to make informed choices based on their preferences (Rabiei-Dastjerdi, McArdle, Matthews, & Keenan, 2021). Furthermore, GIS significantly influences property tax assessment, providing administrators with comprehensive and accurate property information, thereby improving assessment processes and streamlining revenue collection (Wang & Li, 2019; URISA & IAAO, 1999).

Despite the underutilization of GIS in property assessment for taxation in Nigeria, it has the potential to improve equitable assessment, proper management, and updated rating information (Oluwadare & Olatoye, 2014; Olaleye, Hamid-Mosaku, & Idowu, 2005). GIS plays a pivotal role in property management, enabling experts to analyse topography, delineate boundaries, identify infrastructure and services, evaluate the property's neighbourhood, and access historical tenure and ownership information (Anselin, 1998; Olaniyi, Udoh, Oyedare, & Adegoke, 2006:a). GIS also helps with land use planning by combining changes in land cover's physical and biological features. It also helps with property valuation and creating hedonic models and valuation maps (Trung et al., 2006; Yalpir et al., 2014; Gatheru & Nyika, 2015).

Many practitioners in Nigeria still rely on traditional approaches in real estate services, limiting the utilization of GIS primarily to academics (Ogunnowo, Iroham & Oloke, 2021). This reluctance may stem from the seeming complexity and the required expertise in GIS implementation. Public awareness of the potential advantages offered by GIS remains low, emphasising the need to advocate for its widespread use among real estate professionals in Nigeria. Therefore, understanding professionals' awareness, utilisation, and the impact of GIS on service delivery is crucial for advancing this advocacy (Ron, Prill, & Elaine, 2001). Against this backdrop, this study seeks to understand the real estate services offered by estate surveyors and valuers in Akure, their awareness and application of GIS, and the influence of GIS on their service delivery. Hence, the study tests the following null hypothesis:

H01: There is no significant relationship between Geographic Information Systems and the services provided by estate surveying and valuation firms in Akure, Nigeria.

LITERATURE REVIEW

A Geographic Information System is a technology that helps people understand geography and make smart decisions (Krista et al., 2023). According to Filchev et al. (2020), geographical data makes it easier for a map reader to extract the information they need for a certain assignment. Using the GIS table of contents, a reader can add more information to a base map of real-world sites on a thematic map (Korycka-Skorupa & Gołębiowska, 2020). GIS is a valuable tool for every field of study. Namangale and Dunga (2022) maintained that Geographic information systems are used in the real estate industry for various purposes, including site analysis, reporting, mapping, market research, property development, city planning, and modelling. Spatial analysis, market research, and property research all benefit from it.

Using GIS, real estate agents can enhance their online platforms (Otegbulu, Ukpong & Umeh, 2015) to provide prospective purchasers with crucial details, such as flood hazards and land quality. Investors can use GIS data to foresee problems that could derail their investments (Galliers, Leidner, & Simeonova, 2020). Lastly, geographic information systems offer robust spatial data analysis, decision-making, and visualisation resources, making them indispensable in contemporary real estate practice (Chen, 2007). The benefits of GIS technologies for real estate were evident in the cities of Boston, San Francisco, and New York in the United States of America, where they were used to create a web-based application that allows residents to view property information, such as zoning, assessed values, and ownership information.

The integration of Geographic Information Systems (GIS) into real estate services traces back to the early 1980s with the advent of desktop GIS (Goodchild, 2000). The appeal of GIS in the real estate sector stems from its cost-effectiveness and user-friendly attributes (Thrall, 1998). GIS, defined as a system for filing, recording, storing, and retrieving land-related information (Ron et al., 2001), has evolved into a sophisticated computer hardware and software configuration specifically designed to capture, store, analyze, manipulate, edit, retrieve, and display spatially referenced data (Akeh and Mshelia, 2016).

Ismail and Buyong (1998) first explored GIS applications in residential property valuation, emphasising their potential to streamline the appraisal process. The study compared homes based on criteria including land area, accessibility, neighbourhood condition, and physical property features using geographical and textual data from similar properties. Dale and McLaughlin (2000) stressed the importance of managing land tenure, value, and usage, asserting that GIS effectively records and analyses these aspects, as highlighted by Ron et al. (2001) and Akeh and Mshelia (2016). Lemmens and Kurm (2000) integrated GIS with land value information systems, focusing on transaction data for property ratings.

Roos (2006) concentrated on GIS applications in property tax valuation, using multiple regression analysis and digital maps to establish a model for the Swedish National Tax Board's website. Cichocinski and Parzych (2006) utilised GIS for real estate assessment, employing spatial analysis techniques to calculate crucial features for property valuation. In Nigeria, Olaniyi

et al. (2006:b) expanded GIS applications to tenement rate collection, showcasing its role in visually presenting property qualities for informed decision-making in property tax assessment. Donlon (2007) provided a theoretical evaluation of GIS applications in real estate services, highlighting their role in displaying geographical data and generating maps for accurate decision-making. Lin, Meng, and Pin (2007) integrated GIS with a management information system (MIS) for online real estate transactions, offering 3D visualisation capabilities. Zhao (2011) designed an object-oriented space-time GIS data model, emphasising the connection between geographic data and spatial-temporal domains. Poletti (2012) linked urban environmental conditions to property value using GIS and spatial statistical analysis. Oluwadare and Olatoye (2014) developed a GIS-based system for efficient property tax collection.

Giannoulakis, Karanikolas, and Xifilidou (2015) created a GIS-based model for market analysis, appraisal, and administration of residential properties in the Greek real estate market. Yang et al. (2015) developed a GIS-based online strategy for delivering land price data, addressing limited access to land pricing information. Otegbulu, Ukpong, and Umeh (2015) investigated GIS applications in retail real estate market analysis in Lagos, Nigeria. Akeh and Mshelia (2016) explored GIS's role in urban land administration in Nigeria, emphasising its potential to expedite title registration, provide tenure security, simplify land application procedures, and reduce corruption in property transactions.

The reviewed studies highlight the many uses and advantages of GIS in real estate, which include land administration, property value, market analysis, and decision-making. Regarding real estate, GIS improves services and outcomes by facilitating efficient data administration, geographical analysis, visualisation, and decision support. Estate surveyors and valuers in Nigeria have a good grasp of GIS theory, but there appears to be a larger knowledge gap regarding technology use. This research aims to fill these knowledge gaps by examining the impact of geographic information systems on real estate surveying, valuation, and other real estate services.

Study Area

Akure, the capital city of Ondo State in southwest Nigeria, serves as the focal point of the research. Known for its vibrant commercial, financial, and educational sectors, Akure serves as the administrative hub of the state. This urban area exhibits dynamic characteristics, with a notable influx of residents contributing to the continuous expansion of the property market in recent decades. The physical features of Akure include a mix of modern and traditional structures, reflecting its evolving landscape. The city's location in southwest Nigeria is in a region known for its economic significance and cultural diversity. Nestled within Ondo State, Akure enjoys a strategic position that enhances its accessibility and connectivity to neighbouring areas.

A blend of residential, commercial, and institutional zones marks the neighbourhood of Akure. The presence of thriving businesses, financial institutions, and educational establishments underscores the city's status as a multifaceted urban centre. The study gains significance against

the recently enacted Land Use Charge in Ondo State, which introduces changes in property taxes and land-use regulations. In Akure, twenty-six estate surveying and valuation firms play a crucial role in evaluating and assessing the implications of the land use charge. Deeply embedded in the local real estate landscape, these firms contribute valuable insights to understanding the economic and regulatory dynamics affecting property in Akure. The metropolis is a dynamic and evolving urban centre with unique characteristics, a strategic location, and a diverse neighbourhood. Motivated by its relevance to the broader context of property dynamics, especially in response to recent regulatory changes, the study focuses on this area.

METHODOLOGY

The Nigeria Institution of Estate Surveyors and Valuers (2022) gathers data from the entire population of certified estate surveying and valuation firms in Akure, totalling 26. The sample consists of the whole population of these firms, totalling 26, according to the Nigeria Institution of Estate Surveyors and Valuers (2022). The researchers targeted the heads of firms to gather feedback on the subject matter. The data collection process utilised a structured questionnaire as the primary tool to elicit information. We carefully designed the questionnaire to capture details about the real estate services offered by estate surveyors and valuers, their awareness of the applicability of Geographic Information Systems (GIS) in these services, the extent of GIS utilisation in providing estate services, and the perceived impact of GIS application on their service delivery.

A frequency distribution table was employed to analyse the data obtained on the services provided by the estate surveying and valuation firms. This statistical approach aids in organising and summarising the categorical data, providing a comprehensive overview of the services offered. Furthermore, we evaluated key aspects by employing a weighted mean score (WMS). Firstly, it gauged the awareness among estate surveyors and valuers regarding applying GIS in rendering estate services. Secondly, it measured how these professionals utilised GIS in their service provision. The Weighted Mean Score (WMS) is given by:

$$WMS = \frac{\sum_{i=1}^{n}(X_i \times W_i)}{\sum_{i=1}^{n} W_i} \quad \text{.....Eq. 1}$$

Where:

WMS = weighted mean score

Xi = value of the variable for the 'i' th observation

Wi = weight assigned to the i-th observation.

n = total number of observations.

Lastly, the study utilised Spearman's rank correlation to examine the relationship between GIS and the perceived impact of GIS on the overall quality and effectiveness of estate services delivered by the surveyed firms. The null hypothesis that there is no significant relationship between Geographic Information Systems and the services provided by estate surveying and valuation firms in Akure, Nigeria, was tested using Spearman's rank correlation. Respondents were asked to rate how GIS can impact real estate services on three Likert scales (1=low, 2=moderate, and 3=high) to achieve this objective. The effect of GIS on real estate services was assessed using a Likert scale ranging from 1 (a highly negative effect) to 5 (a highly positive effect). We calculated Spearman's rank correlation coefficient (rho) mathematically as follows:

$$\rho = 1 - \frac{6\Sigma d_i^2}{n(n^2-1)} \quad \text{.....Eq. 2}$$

Where:

Σdi2 = sum of squared differences,

n = number of pairs of observations

This methodological approach ensures analysis of the collected data, shedding light on the awareness, utilisation, and impact of GIS in the context of estate surveying and valuation. By clearly understanding the sampling procedure and employing robust statistical techniques, the study aims to contribute valuable insights to the field, benefiting policymakers, professionals, and researchers in estate surveying and valuation.

RESULTS, ANALYSIS AND DISCUSSION

The data analysis used information from the twenty-six estate surveying and valuation firms. The findings are presented in Table 1, which illustrates the percentage distribution of estate services offered by these firms regarding their utilization of Geographic Information Systems (GIS). The Table provides a comprehensive overview of the different estate services offered by estate surveying and valuation firms and how extensively GIS is employed within these services. The percentages in the Table represent the proportion of firms providing specific estate services incorporating GIS technologies into their operations.

This analysis sheds light on the current state of GIS implementation and its impact on the delivery of estate services. The results presented in Table 1 highlight the varying degrees of GIS integration across different estate services.

Table 1: The various services rendered by the estate surveying and valuation firms

Services Rendered	YES		NO	
	Frequency	Percentage	Frequency	Percentage
Real Estate Marketing	25	96.2	1	3.8
Property Valuation	26	100	-	-
Property Management	26	100	-	-
Land use Charge Administration	7	26.9	14	53.8
Neighbourhood planning	4	15.4	15	57.7
Feasibility and Viability	25	96.2	1	3.8

Source: Fieldwork (2023)

Table 1 presents the services provided by estate surveying and valuation firms in Akure. Participants were asked about their involvement in various real estate services, including but not limited to neighbourhood planning, property valuation, land use charge administration, property management, and feasibility and viability studies. Table 1 shows that all surveyed firms are involved in property management and valuation, indicating how important these services are for estate surveying and valuation firms in Akure. Still, it's worth noting that some services, like neighbourhood planning and land use fee administration, have unusually low response rates. Only 26.9% of the enterprises provide land use charge administration services, while neighbourhood planning activities are engaged by an even smaller percentage, about 15.4%. There may be room for improvement here, and it raises the possibility that there are chances to have more people involved with these services. Also, a few respondents did not answer the questions on "Land Use Charge Administration" and "Neighbourhood Planning." As the lack of response indicates, most estate surveying and valuation firms in Akure must be aware of or interested in these matters. Consequently, based on the patterns shown in Table 1, estate services should benefit from using geographic information systems to improve themselves, especially in less-engaged areas. Considering its extensive usage in real estate management, it is encouraging to see GIS used for neighbourhood planning and land use charge administration.

Table 2 shows that respondents understood the role of GIS in different types of real estate services. A weighted mean score was used to analyse the data collected on a Likert scale. The table suggests respondents understood how GIS may be used for real estate marketing. The average score was 3.46, so it's reasonable to argue that most are well-informed. The industry's focus on using GIS for effective marketing strategies is commensurate with this. As shown by mean scores of 3.23 for property management, 2.85 for feasibility and viability analysis, and 2.85 for valuation, respondents also show a reasonable level of awareness in these areas. Such results

indicate a solid grasp of how GIS might improve certain facets of real estate services. With mean scores of 2.72 and 2.62, respectively, Table 2 needs to show more understanding regarding implementing GIS in neighbourhood planning and land use charge analysis. The results in Table 1 suggest that this may be because the respondents used these services sparingly.

Table 2: The degree to which firms are aware of the usage of GIS in the supply of Real Estate Services

Services Rendered	Very high	High	Moderate	Low	Very Low	Mean Score
Real Estate Marketing	2(7.7)	16(61.5)	4(15.4)	1(3.8)	3(11.5)	3.46
Property Management	1(3.8)	8(30.8)	8(30.8)	4(15.4)	5(19.2)	3.23
Feasibility and Viability Analysis	1(3.8)	8(30.8)	8(30.8)	5(19.2)	2(7.7)	2.85
Valuation	3(11.5)	1(3.8)	13(50.0)	7(26.9)	2(7.7)	2.85
Neighbourhood Planning	2(7.7)	10(38.5)	1(3.8)	3(11.5)	10(38.5)	2.72
Land Use Charge Analysis	1(3.8)	4(15.4)	9(34.6)	8(30.8)	4(15.4)	2.62

Source: Fieldwork (2023)

Table 3 shows the utilisation of Geographic Information Systems (GIS) among Akure's practising estate surveyors and valuers. Despite a substantial understanding of the software's applicability, respondents demonstrate a significantly low degree of GIS application in their service provision. This data indicates that awareness of GIS among estate surveyors and valuers does not readily translate into practical implementation. When examining specific service areas offered by Akure Estate Surveyors and Valuers, it becomes evident that they predominantly employ GIS in real estate marketing activities compared to other domains. This outcome suggests that estate surveyors and valuers in Akure acknowledge the potential benefits of GIS in enhancing marketing efforts, leading to a comparatively higher utilisation rate in this specific area. Remarkably, only one respondent reported frequent usage of GIS in property management, indicating limited adoption of the software in this field. The overall trend identified in Table 3 aligns with this observation, emphasizing estate surveyors and valuers in Akure's hesitance to incorporate GIS into their professional practices. Table 2 offers additional insights into respondents' perceptions of GIS, confirming that despite recognising the existence and purpose of GIS, most respondents admit to not incorporating it into their services. It aligns with observations from Table 3, reinforcing that awareness of GIS does not necessarily lead to its practical implementation among estate surveyors and valuers in Akure.

Table 3: GIS Application in Real Estate Services

Services Rendered	Most Often	Often	Less Often	Not Used	Mean Score
Real estate Marketing	-	-	17(65.4)	9(34.6)	1.65
Neighbourhood Planning	-	-	12(46.2)	14(53.8)	1.46
Property Management	-	1(3.8)	9(34.6)	16(61.5)	1.42
Feasibility and Viability Analysis	-	-	7(26.9)	19(73.1)	1.27
Land Use Charge Administration	-	-	7(26.9)	19(73.1)	1.27
Property Valuation	-	-	6(23.1)	20(76.9)	1.23

Source: Fieldwork (2023)

Table 4 presents Spearman's rank correlation analysis between geographical information systems and Estate Surveying and Valuation Firms' Services. For GIS and itself, the correlation coefficient is naturally 1.000. However, the more significant finding is the correlation between GIS and firm services, which is 0.638. This positive correlation suggests a strong relationship between the two variables, indicating that as one variable increases, the other also tends to increase. The p-value of less than 0.001 for this correlation coefficient indicates high statistical significance, suggesting that the observed relationship is not likely due to random chance. The large sample size of 26 observations for both variables adds confidence to the results. These findings imply a meaningful and statistically significant positive association between geographical information systems and estate surveying and valuation firms' services, providing valuable insights into these factors' potential interdependence or influence in the context under investigation. Therefore, the null hypothesis (H01) that there is no significant relationship between Geographic Information Systems and the services provided by estate surveying and valuation firms in Akure, Nigeria, is rejected.

Table 4: Correlation Analysis between Geographical Information System and Estate Surveying and Valuation Firms' Services

			Geographical Information System (GIS)	Estate Surveying and Valuation Firms' Services
Spearman's rho	GIS	Correlation Coefficient	1.000	.638**
		Sig. (2-tailed)		0.000
		N	26	26
	Estate Surveying and Valuation Firms' Services	Correlation Coefficient	.638**	1.000
		Sig. (2-tailed)	0.000	
		N	26	26

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Fieldwork (2023)

CONCLUSION

The study examined the critical role of Geographic Information Systems in the real estate industry, particularly in the context of estate surveying and valuation firms in Akure, Nigeria. GIS, a computerised database management system, plays a crucial role in recording, storing, retrieving, analysing, and visualising location data, making it indispensable for decision-making in property-related matters. The real estate professionals in Nigeria, offering diverse services such as estate agency, property management, land administration, and property assessment, benefit significantly from the enhanced data availability and analytical tools provided by GIS. Regardless of the potential advantages of GIS in various real estate services, including property management, valuation, and land use charge administration, the study revealed that many practitioners in Nigeria still rely on traditional approaches, limiting the widespread utilisation of GIS primarily to academics. Practitioners in Nigeria still rely on traditional approaches, limiting the widespread utilisation of GIS primarily to academics due to the perceived complexity and expertise required for GIS implementation. The study also highlighted the low public awareness of the potential advantages offered by GIS, emphasising the need for advocacy and increased adoption among real estate professionals in Nigeria.

The investigation focused on Akure, the capital city of Ondo State, providing insights into the real estate services offered by estate surveyors and valuers in the region. The study assessed their awareness and application of GIS and examined the influence of GIS on their service delivery. The findings revealed a notable gap between understanding and practical implementation of GIS, with respondents demonstrating a lower degree of GIS application in their service provision than anticipated. Statistical analyses were employed to analyse the collected data, including frequency distribution, weighted mean score (WMS), and Spearman's rank correlation. The results indicated variations in the degree of GIS integration across different estate services, with a significant positive correlation between GIS and estate surveying and valuation firms' services. However, the correlation did not necessarily translate into widespread GIS implementation among practitioners. Therefore, the study provides valuable insights into the current state of GIS utilisation in the real estate sector in Akure, Nigeria. The findings underscore the importance of bridging the gap between awareness and practical application of GIS among estate surveyors and valuers. Recommendations for increased awareness campaigns, training programmes, and collaborative efforts between academia and industry practitioners are essential for fostering the effective integration of GIS in real estate services.

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