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EXPLORING THE INTEGRATION OF ARTIFICIAL INTELLIGENCE IN THE NIGERIAN REAL ESTATE PRACTICE

Purpose: *Artificial Intelligence (AI), defined as the ability of machines to perform cognitive functions typically associated with human minds, has been widely adopted across various sectors, including finance, healthcare, engineering, technology, and manufacturing. Given the increasing relevance of AI in multiple industries, this study aims to examine the extent to which AI has been adopted in the Nigerian real estate sector, particularly focusing on its potential to enhance real estate practices in a data-poor economy like Nigeria.*

Design/methodology/approach: *The study adopts a survey approach to investigate how Nigerian Estate Surveyors and Valuers utilize AI in their practices. Key areas of AI application, its perceived benefits, and the limitations hindering its adoption were explored. A census sampling technique was used to distribute structured questionnaires to 75 registered and practicing Estate Surveying and Valuation firms in Benin City. Of the 75 questionnaires, 64 (85.33%) were returned and deemed valid for analysis. The data were analyzed using frequency distribution and the relative importance index (RII).*

Findings: *The findings indicate that AI is perceived to significantly improve the efficiency of real estate operations, provide more accurate property valuations, reduce corruption and fraud in property valuation, and enhance customer service experiences, with mean values exceeding 3.00 and a relative importance index of not less than 0.63. The study further confirms that AI can be applied across various areas of real estate practice identified in the research. However, certain limitations were identified as barriers to the broader adoption of AI within the sector.*

Originality/value: *This study concludes that the adoption and implementation of AI in Nigerian real estate practice hold significant potential benefits, particularly in increasing operational efficiency and accuracy. This research recommends that Estate Surveyors and Valuers should pursue comprehensive training to better integrate AI into their practices and align with global technological advancements.*

Keywords: *Artificial intelligence, Data-poor economy, Estate Surveyors and Valuers, Nigerian property market, Real estate practice, Technology adoption,*

Introduction

Artificial intelligence (AI) has emerged as a transformative force across multiple industries, driving efficiency, innovation, and growth on a global scale (Chaphalkar & Sandbhor, 2013). Its applications span finance, healthcare, law, engineering, and manufacturing, leveraging advancements in machine learning, neural networks, and predictive analytics to optimize decision-making and operational processes (Aldoseri, Al-Khalifa & Hamouda, 2023; Pitz et al., 2024). The real estate sector is no exception (Kandipati, 2025), as AI is revolutionising property valuation, market analysis, customer engagement, and security systems, enhancing both investor confidence and consumer experiences. The rapid advancement of AI in recent years has brought significant transformation across various industries, including real estate. AI's integration into organisational workflow has enhanced operational efficiency, reduced costs, and increased profitability by leveraging vast amounts of readily available data (Liu, 2022). In the real estate sector, AI-driven technologies such as machine learning, natural language processing, and computer vision are revolutionizing key operations. For instance, automated property valuation and market analysis improve accuracy by processing extensive datasets and generating predictive insights (Pitz et al., 2024). Similarly, AI-powered chatbots and virtual assistants enhance customer interactions and streamline service delivery, while smart home innovations and AI-driven security systems add value to properties, making them more attractive to investors (Chaphalkar & Sandbhor, 2013).

In understanding whether AI applications are relevant to the real estate sector, Conway (2018) opined that the adoption of real estate technology and innovation is a mile away. The study concluded that technology experts and investors can improve the real estate business by putting data to work in different ways such as making better decisions, creating efficiencies in workflow, and reducing risk through an improved understanding of the potential applications and opportunities for machine learning and artificial intelligence. Chaphalkar and Sandbhor (2013) opined that the adoption of artificial neural networks (ANN) in real estate valuation performs better when compared to other AI tools. Most literature demonstrated the use of AI in real property valuation and auction evaluation (Chaphalkar & Sandbhor 2013; Ge, Ishaku & Lewu 2021; Vishwakarma et al. 2023). Consequently, there is a need to undertake an evaluation of the different areas of real estate practice where AI is of utmost importance.

The Nigerian real estate market is at a critical juncture, where the adoption of AI can propel the industry toward greater transparency, efficiency, and sustainability. The Nigerian real estate sector, amid rapid urbanisation and economic growth, is grappling with significant challenges that impede its efficiency and development. Traditional property valuation methods are often inefficient and inaccurate, leading to price disparities and market instability. Access to reliable market data is limited, making it difficult for stakeholders to make informed decisions, thereby reducing investor confidence. Additionally, the sector is plagued by cumbersome bureaucratic processes that complicate property transactions, resulting in delays and increased susceptibility to corruption. Poor customer service further exacerbates these issues, impacting client satisfaction and retention. Moreover, inadequate security measures in residential and commercial properties pose significant risks, deterring potential investors and tenants.

Despite AI's widespread adoption in global real estate markets, its integration in developing economies remains limited. AI-driven tools, such as automated valuation models and predictive market analytics, can significantly improve transparency, efficiency, and risk management (Conway, 2018; Vishwakarma et al., 2023). In property markets such as in Nigeria, real estate transactions are still largely dependent on conventional methods, characterised by inefficiencies, data asymmetry, and bureaucratic challenges (Oladokun & Mooya, 2024). The adoption of AI in Nigeria's real estate sector presents a unique opportunity to address these gaps, in order to provide accurate property valuations, enhance market predictability, and streamline service delivery. This paper explores the synthesis of AI in Nigerian real estate practice, highlighting how AI is reshaping the industry landscape, driving market efficiency, and enhancing customer experiences. The paper examines the current state of AI adoption in Nigerian real estate practice, identifies the areas of applications and benefits, and discusses the challenges and potential solutions for broader AI integration. The need for AI integration in the Nigerian real estate sector is essential to understanding how it can address current inefficiencies and drive sustainable growth. Therefore, this research aims to contribute to the modernization and competitiveness of Nigeria's real estate market. The focus on AI rather than other technological tools is justified by its transformative potential in reshaping real estate practices through automation, predictive analytics, and enhanced decision-making. Unlike conventional digital tools such as property listing platforms and Geographic Information Systems (GIS), AI offers dynamic capabilities, including machine learning-driven property valuation, risk assessment, and market trend forecasting. These functions

are particularly relevant in emerging markets like Benin City, where real estate decision-making often relies on intuition and limited data analytics. AI's ability to process vast amounts of property data, predict future trends, and optimise transactions makes it a critical tool for addressing inefficiencies in the local market.

Literature review

This section aims to provide a comprehensive overview of current research and applications of AI in real estate, examining its potential impacts, benefits, challenges, and future directions. AI is rapidly transforming industries worldwide, and the real estate sector is no exception.

AI can be defined as the concept that human intellect is understood in a way that enables technological devices to replicate people and finish any work that is assigned to them (Adejumo et al., 2024), independent of the degree of complexity or simplicity. According to Dimopoulos and Baakas (2019), it is a machine intelligence that uses mathematical models to compete with human ability to do a given activity, therefore replicating human observation. In the words of Kaplan and Haelein (2019), AI is a system that can learn data to achieve certain actions and goals. Research and development have gone towards improving the capacities of artificial intelligence for a range of tasks and purposes, including learning, reasoning, and sensing (Adejumo et al., 2024). Anderson and Rainie (2018), believed that given the rapid development of artificial intelligence, systems that will exceed human capability for knowledge absorption and cognition may emerge.

The historical evolution of AI in real estate can be traced back to the early use of data analytics in property valuation and risk assessment (Ewert, Brodowicz, & Pospieszny, 2018; Abioye et al., 2021). Initially, AI applications were limited to simple rule-based systems, but with advancements in machine learning and big data processing, AI has become more sophisticated, offering real-time insights and decision-making support (Brynjolfsson & McAfee, 2017). Over time, the capabilities of artificial intelligence have expanded from merely analysing historical property data to real-time forecasting, leveraging geospatial analytics and neural networks to predict future property values and demand patterns. Today, it plays a crucial role in smart urban planning, facilitating sustainable real estate developments through predictive modelling and automated infrastructure monitoring.

It's evolution in real estate practice has been transformative, reshaping the ways properties are valued, managed, and transacted across different regions. In real estate, the combination of human

knowledge and logical processes with AI first emerged in the 1990s (Moshkowicz, Gomes, & Mechitov, 2011). AI is fast expanding and altering many facets of the real estate sector. Real estate agents employ artificial intelligence to raise output, streamline procedures, and enhance user experience. The pace and extent of AI adoption vary significantly between developed and developing nations due to factors such as digital infrastructure, regulatory frameworks, and market readiness. While developed economies have fully integrated AI-driven technologies into real estate, the adoption trajectory in developing nations, particularly in Africa and Nigeria, presents unique challenges and opportunities.

The adoption of AI into real estate practice has been beneficial in several ways, such as reducing human errors in property valuation, early detection of maintenance issues, proactive tenant screening processes, data collection, and insights, among other benefits. In developed nations, AI is a cornerstone of modern real estate operations, enabling automated valuation models, predictive analytics for property market trends, and AI-driven property management solutions (Ghosh & Lepetit, 2020). AI-powered platforms leverage big data and machine learning algorithms to enhance investment decision-making, improve property search efficiency, and personalize client interactions. The use of AI-enabled chatbots, virtual assistants, and blockchain-based smart contracts has streamlined transactions, reducing reliance on intermediaries and minimising fraud risks (Wang et al., 2019). Furthermore, AI has facilitated the development of smart buildings that integrate Internet of Things (IoT) devices, optimising energy consumption, security, and predictive maintenance (Chen et al., 2021). These innovations have revolutionized real estate practice by increasing transparency, operational efficiency, and overall market accessibility.

With AI's ability to solve complex problems, reduce costs, and deliver personalised experiences, its integration into real estate operations holds immense potential. AI is the ability to perform the intelligent functions of the human brain (Chaphalkar & Sandbhor, 2013). In Verma (2018), it was regarded as programming a machine in a way that it can think and act at the same level of human intelligence. In today's world, machines have been so designed that they can perform human activities; physical and mental. Machines now recognise speeches, plan programs, and events, and learn and solve simple and complex problems. Chan and Abidoye (2017), demonstrated that accurate and consistent artificial intelligence valuation techniques can be. Professional bodies' reaction to present technical trends can help one to understand the low acceptance of artificial

intelligence solutions in real estate practice. Furthermore, responsible for valuation errors could be the use of inappropriate property valuation methods that mislead users of valuation reports (Abidoye & Chan, 2019). Sani (2022) claims that while property valuers know AI, they have never looked at using AI in their valuation process.

The real estate industry in developing nations remains at an early stage of AI integration due to infrastructural limitations, insufficient digital databases, and inadequate regulatory adaptation. Africa's real estate sector, while gradually adopting AI, faces significant roadblocks. Some African nations, such as South Africa and Kenya, have leveraged AI for market analysis, automated valuation, and property listing services (Okonkwo & Kinyua, 2022). AI-powered applications facilitate smoother transactions by connecting buyers with sellers and enhancing transparency in land registry systems. However, challenges such as unreliable internet penetration, high costs of AI solutions, and concerns over algorithmic bias hinder widespread adoption.

Nigeria, as Africa's largest economy, presents a unique case of AI integration in real estate. The rise of proptech startups has led to increased use of AI-driven property platforms, particularly in urban centers like Lagos and Abuja. These platforms utilise AI for fraud detection, digital lease management, and predictive pricing models, offering valuable insights into market fluctuations (Oladimeji & Adeniyi, 2023). Despite these advancements, Nigeria faces significant barriers, including inconsistent government policies, lack of standardized real estate data, and cybersecurity vulnerabilities. Moreover, AI-driven property valuation models often struggle with inaccurate or incomplete datasets due to poor land documentation systems, making their reliability questionable in certain contexts (Adegbite & Ojo, 2022).

Property valuation has emerged as a prevalent topic in literature, with a multitude of cases for AI in real estate (Starr, Saginor & Worzala, 2021). The real estate domain is inherently data-driven, and the growth of the internet has provided an extensive amount of data on real estate markets and transactions, making it an ideal field for AI applications. Property valuation is situated within this domain. Additionally, mathematical modelling is a component of valuation, which is a domain in which AI can capitalise on its unique capabilities (Naz et al., 2022). Therefore, it is unsurprising that the potential of AI in valuation is significant, given its ability to process extensive datasets.

The AI valuation literature primarily examines technological aspects, introducing and contrasting a variety of mathematical models based on their comparative strengths and limitations. Starr,

Saginor and Worzala (2021) assert that the future of real estate valuation is likely to be automated, implying that AI may eventually supplant human involvement in this field. Real estate development is an additional application of AI in the real estate sector. Smart real estate development is another developmental initiative that employs AI (Liu, 2022). Although there is a significant body of literature on AI in property development, it appears to be somewhat less extensive than AI in real estate valuation. This discrepancy may be attributed to the fact that the nature of development is less data and model-driven than valuation, which makes the use cases of AI less apparent. Nevertheless, Liu (2022) argues that research findings regarding the integration of artificial intelligence and big data in the development of real estate are relatively extensive. Conway (2018) opined that portfolio managers, appraisers, assessors are now moving further as there is now more data to predict what rents would be based on local conditions. The use of AVM has been seen to be advantageous in terms of speed of analysis and improve accuracy over traditional approaches. In real estate, several functions are carried out, such as valuation, property/facility management, auctioneering, property development, investment and appraisal among others.

Chaphalkar and Sandbhor (2013) compare different AI techniques that can accurately predict and forecast outcomes on property valuation in India. The techniques include the use of ANN, multi-regression analysis (MRA), fuzzy logic, expert system and genetic algorithm techniques. Results show that ANN performed better than MRA because of its ability to learn and recognise complicated patterns and the ease of its application with little statistical knowledge of the set of data provided. Morano, Tajani, and Torre (2015) studied the application of ANN to housing appraisal in Italy. The study used a sample of 90 residential properties sold within 2013-2014. The study illustrated two considerations when drawing conclusions. The study opined that it was impossible to produce a direct functional relationship between input and output values nor to promptly investigate and reproduce the mechanisms of the prices formation while the other consideration was that there was the possibility of the results generated through ANN not been stable but could be improved with increasing sample size.

Vishwakarma et.al., (2023) examined the use of AI in different areas of the real estate industry. The study noted that some of the recent studies of AI in the real estate sector have achieved breakthroughs. These include improved property valuation, enhanced property management,

increased operational efficiency, improved marketing and sales, better customer engagement, improved property search and matching, simplified property management, real estate investment predictive analytics, improvement in property search and matching, personalised property recommendation based on preferences and creation of smart homes. Vishwakarma *et al* (2023) concluded that the integration of AI into real estate practice will greatly increase the industry's efficiency, accuracy, and customer satisfaction.

The benefits of AI in real estate practice are substantial. AI enhances market efficiency by automating valuation processes, reducing transaction costs, and improving accuracy in demand forecasting (Wang et al., 2019). The integration of AI-driven decision-support systems allows developers and investors to make data-driven decisions, mitigating financial risks associated with volatile markets. AI-enabled smart buildings contribute to sustainability by optimizing energy consumption, detecting maintenance needs, and ensuring better security management (Chen et al., 2021). In addition, AI-driven customer service solutions, such as virtual property tours and AI-assisted legal documentation, improve the overall user experience in property transactions.

Despite its potential, AI adoption in real estate comes with notable drawbacks, particularly in developing nations. One of the primary concerns is the cost of implementation, as AI solutions often require significant investment in infrastructure, software, and expertise (Adegbite & Ojo, 2022). Many real estate firms in Africa and Nigeria lack the financial capacity to integrate AI into their operations effectively. Additionally, the absence of comprehensive real estate databases impedes AI's ability to generate accurate predictions and valuations. Ethical concerns also arise, as AI models can reinforce biases in property valuation and mortgage approvals, potentially exacerbating inequalities in access to housing (Muguchu, 2021). Furthermore, fears over job displacement due to automation highlight the need for strategies that balance AI integration with workforce development. AI has the potential to redefine real estate practice in Nigeria and across Africa, fostering an efficient, transparent, and sustainable property market. However, realising this potential requires a holistic approach that addresses infrastructure deficits, regulatory gaps, and ethical concerns. With strategic implementation and collaborative efforts among stakeholders, AI can serve as a catalyst for innovation, resilience, and long-term growth in the real estate sector.

Abidoye et al., (2021) investigated the prospects, obstacles, and motivations of adoption of AI in real estate practice and found that valuers express worries that the acceptance of artificial

intelligence may lower valuation error, and that regulatory authorities are the key drivers behind adoption. With an eye towards market expansion and leveraging the possibilities presented by applying AI models in the commercial real estate sectors, Kayihura (2021) focused on the actions of significant market players. Based on a qualitative approach based on interviews, the study shows that the AI valuation models in the Swedish commercial real estate markets are slow and should only be applied on valuation data instead of actual transaction data. According to Chaphalkar and Sandbhor (2013), property owners and real estate investors feel that using AI prediction models to precisely assess the estimated value and computed risk of their properties will help them to maximise their expected returns on investments. Alsahan and Alzaidan (2024) explored the possibilities and difficulties of using AI in valuation methods. The study concluded that following the fresh paths for accuracy, efficiency, and openness in real estate assessment will help to offset the challenges presented by following conventional methods. Table 1 presents a summarized source of the benefits and limitations to AI applications in real estate.

Insert Table 1 here

Methodology

Study area

The study location for the research is Benin City, Nigeria. Benin City is a vibrant and rapidly developing urban area with a rich cultural heritage and a growing economy. The real estate sector is expanding, driven by urbanization and economic activities. Benin City, the capital of Edo State in southern Nigeria, is one of the country's most historic and culturally rich urban centers. Located approximately 320km east of Lagos, Benin City is known for its rich heritage, including the ancient Benin Kingdom and its renowned bronze artifacts.

Benin City has experienced rapid urban expansion, leading to increased demand for residential, commercial, and industrial properties. The real estate market in Benin City is characterised by a mix of modern high-rise buildings and traditional housing. The city's real estate landscape is dynamic, with ongoing developments aimed at addressing housing shortages and improving infrastructure. Real estate is one of the property hubs, being a major driver of its economy. Over the years, it has continued to make an impact as it is a source of investment to many from both local and foreign investors and a source of employment for many. The real estate industry in Benin

City, like in many other emerging markets, is gradually embracing technological advancements, including the use of AI.

Benin City, despite not being Nigeria's largest real estate market, presents a compelling case for investigating the integration of AI in real estate practice. As a rapidly growing urban centre with a dynamic property market, Benin City reflects the evolving challenges and opportunities that AI can address in a developing economy. The city has experienced significant population growth, infrastructural expansion, and increasing real estate activities, making it a suitable microcosm for studying AI's potential impact. As one of Nigeria's historic and culturally rich cities, Benin City presents distinctive urban dynamics and property transaction characteristics that differ from the high-volume markets of Lagos, Abuja or Port Harcourt. Its real estate sector, while less saturated, is rapidly evolving due to increasing digital awareness and emerging technological interventions.

Benin City offers a unique context to examine the feasibility, readiness, and barriers to AI implementation in an emerging real estate sector. Moreover, real estate practitioners in secondary markets often face operational inefficiencies, valuation inaccuracies, and information asymmetry, issues AI can mitigate. Investigating Benin City allows for an in-depth understanding of how AI can enhance decision-making, property valuation, and risk assessment in a mid-tier market. Additionally, the relatively nascent use of AI in Benin City offers researchers a less complex landscape to pilot and refine innovative approaches before they are scaled to larger, more competitive markets. The findings therefrom can provide scalable insights applicable to similar cities, contributing to the broader discourse on AI-driven real estate transformation in Nigeria.

Research technique

The study adopted a quantitative research technique. In obtaining empirical data, a structured questionnaire was developed and distributed among Estate Surveying and Valuation firms in Benin City, Nigeria. The directory of the Nigerian Institution of Estate Surveyors and Valuers (NIESV), Edo State Branch revealed that a total of 75 Estate Surveying and Valuation firms are operational within the state. As a result, this figure forms the sample frame and size adopted for the research. A census survey collects data from every person in a specific population or group. In this technique, all units from the population of interest are analysed. This study adopts this technique with the aim of providing a complete and accurate count of all population members being studied without relying on sampling or estimation. This is also done to get reliable information from the

participants, ensure good representation, be unbiased, and allow for drawing reasonable conclusions. A structured questionnaire was drafted to collect data from the respondents. The questionnaire was designed to assess the adoption, its perceived benefits, and challenges in real estate practice. To ensure the reliability and internal consistency of the instrument, a reliability assessment was conducted using Cronbach's alpha. This statistical measure evaluates the coherence of the questionnaire items, with Cronbach's alpha value that indicates the level of acceptable reliability. Table 2 shows the reliability test results for the study. The result confirmed that the questionnaire was a valid and reliable tool for data collection, thereby enhancing the robustness of the study's findings.

Insert Table 2 here

As a result of the approach adopted, a total of 75 questionnaires were distributed to the firm of practicing Estate Surveyors and Valuers, who are the respondents for this study. Despite administering questionnaire to the entire population, only 64(85.33%) were returned and valid for analysis. The respondents were selected using the census sampling technique.

Method of data analysis

Responses were computed with the results presented using the relative importance index for the data analysis. A 5-point Likert scale was adopted for questions on the perceived benefits of deploying AI in real estate practice, areas of AI application in the real estate industry, and the perceived limitations to the use of AI in the real estate industry in Nigeria. The Likert scale is the most often used tool in research for respondents to indicate the level of relevance based on their personal experiences. The Likert scale used in this study consists of five points, each representing a different level of extent: 1 signifies "strongly disagreed," 2 signifies " disagreed," 3 signifies "moderate," 4 signifies " agreed," and 5 signifies "strongly agreed". The points of the Likert scale used are equal to the value of weighting (W) given to each factor by the respondent. This means that the responses from the Likert scale were computed for mean ratings of each factor following their level of importance as perceived by the respondents. The mean scores were then ranked according to their weighted level of importance. The Relative Importance Index (RII) was calculated by using equation (1).

$$RII = \frac{\sum W}{A*N} \quad \text{..... eqn (1)}$$

Where: *W = weighting given to each factor by the respondent; A = the highest weight in the research and N = total number of respondents.*

The decision rule for the 5-point Likert scale used in the study is set at 3.00, such that an attribute is classified as agreed if the mean score is ≥ 3.00 and classified as disagreed if < 3.00.

Results and discussion

Table 3 shows the respondent's profile and their perceptions of the use of AI in the real estate industry. As regards professional qualifications, probationers, the least membership cadre in the registry of the NIESV membership record the lowest response rate (3.13%), associates above 10 years (43.75%), and fellows (28.13%) form the highest response rate. Similarly, 71.88% of the respondents have been in the practice of real estate for over 10 years. This indicates that they possess the requisite knowledge of the field and that their responses can be relied upon in drawing conclusions for the study. Regarding the real estate professionals' awareness of the concept of AI, 75% of them subscribed to the response "definitely yes" signifying their awareness while 3.13% responded as "probably no". This result suggests a high likelihood that these professionals have an understanding and awareness of the existence of AI.

Insert Table 3 here

The study also enquires whether AI as a technological advancement can be deployed to meet the needs of real estate practice. Findings show that 56.25% of the respondents completely agreed that AI can be used to enhance the practice of real estate while 9.38% disagreed with this opinion. The Table also shows the result of whether they use AI while rendering their professional service, 46.88% opined that they do not use AI at all, 10.94% responded to "moderate" with its use and 7.84% agreed that they use AI. This suggests that the tool has not been widely embraced by practitioners as it can be concluded that most professionals rely more on traditional practice when discharging their core duties.

Insert Table 4 here

Table 4 presents the result on the perceived benefits of deploying AI in the provision of real estate services to clients. To achieve this, seven (7) benefits extracted from the literature were presented to the respondents. The response rate shows that it "increases efficiency in real estate operations", "provides more accurate property valuation"; helps reduce corruption and fraud in property valuation"; "improves customer service experience" and is "easy to adopt and integrate into real estate domain" met the threshold with mean values greater than 3.00. This implies that the use of AI can be very beneficial in the real estate industry in that it would increase and streamline the efficiency of real estate operations, thereby providing accurate valuation appraisal and mitigate the corrupt practices that abound in property valuation. This agrees with the findings Conway (2018) that automated valuation models (AVM) are deemed accurate and good enough when valuing large numbers of properties. It could also improve the customer service experience because the respondents deemed the technology to be very easy to use. This result is in tandem with Vishwakarma et al. (2023) that AI-powered chatbots can provide efficient and effective customer support that can lead to their satisfaction. However, it can be concluded that "enabling predictive property maintenance" and "streamlining decision-making" with mean values of 2.83 and 2.53, and relative importance index of 0.57 and 0.51 respectively are perceived to be of less importance. This negates the study of Vishwakarma et al. (2023) that AI applications can streamline activities involved in property management when making investment portfolio decisions.

Insert Table 5 here

Table 5 shows the respondent's perception of the areas in real estate practice where AI can be applied. In property management, the respondents indicated that AI is effective in 6 activities highlighted with the result showing a mean value > 3.00. This implies that AI can be applied in property management. Being an important area of practice in real estate, well-maintained property can have a longer economic life and generate better investment returns. These findings corroborate Vishwakarma et. al (2023) that AI can be applied in maintenance scheduling and rent collection.

Property valuation is another key area of real estate. Property appraisers are key in real estate investment decisions. Financial institutions rely on valuation reports for mortgage finance. The respondents agree that "large data can be analysed using AI algorithm", "improve speed and efficiency and produce more precise valuation results with mean values of 3.70, 3.63 and 3.23 with

relative importance index of 0.74, 0.73 and 0.65 respectively. AI can be applied in property valuation, thus producing a more accurate result for the user. This is in tandem with the findings of Vishwakarma et. al. (2023).

The result in Table 5 shows the responses to the activities listed under real estate agency/marketing. From the table, all the activities have a mean value that is greater than 3.00 and with a relative importance index of not less than 0.65. This implies that AI can assist in real estate agency/marketing. This is in tandem with the findings of Alzain et al., (2022). The study of Vishwakarma et. al. (2023) also nexus that the application of AI would assist property buyers and rentals to find properties that would meet their needs and standards.

The results on the application of AI in real estate investment appraisal are presented in Table 5. From the Table, "identify patterns and trends that are not obvious to analysts"; "enhance the accuracy of real estate investment decisions"; "use to analyse data and forecast real estate investments"; "predict future property values" and "analyse real estate performance and economic indicators for more informed decisions" shows that AI can be applied in resolving these issues with mean values greater than 3.00 and with relative importance index of not less than 0.63. This implies that the application of AI in real estate investment appraisal will be very helpful. Bartram et al. (2020) stated that AI provides better estimates of returns and covariance than conventional methods.

The result also shows that AI can be applied in real estate auctions. The result revealed that "AI chatbots promote widespread information of auctions"; "set benchmark price for auction"; "set general conditions for auction" and "forecast probable sale price on bidding" are accepted as areas of application of AI in real estate auctioning. However, the respondent disagrees with the ability of AI to forecast income to the seller with a mean value of 2.95 and RII value of 0.59. Ge et al, (2021) found that the ANN model with auctioneering is more efficient.

The aggregate mean analysis provides a comparative assessment of the perceived effectiveness of AI applications across various specializations within the real estate industry. The findings suggest varying degrees of AI adoption and integration, reflecting global trends in technological

advancements and their impact on real estate operations. With an aggregate mean of 3.46, AI applications in real estate agency and marketing emerged as the most significant area of adoption. This result aligns with global trends, where AI-driven property search engines, virtual tours, and predictive analytics have transformed the way properties are marketed and transacted (Zhang et al., 2022). The highest-ranked sub-category, "aiding in property search" (4.00), underscores the growing reliance on AI algorithms in matching prospective buyers or tenants with available properties based on personalized criteria. Similarly, AI-enhanced remote marketing and property inspections (3.75) reflect the increasing use of virtual reality (VR) and augmented reality (AR) technologies in property visualisation. These developments are consistent with that of Liu and Wang (2021) where it was established that AI-powered platforms have improved market efficiency by providing data-driven property recommendations and real-time market analysis.

AI's role in property management is also highly recognised, with an aggregate mean of 3.29. The findings indicate that AI-driven solutions are particularly valued for their ability to schedule predictive maintenance and automate operational processes, with "planned maintenance/repair scheduling" and "predicting rent over time" both ranking first (3.55). These applications align with global advancements in smart property management systems, which leverage AI and the Internet of Things (IoT) to enhance building efficiency and reduce operational costs (Deng et al., 2023). However, the relatively low ranking of "AI used only in property management" (2.03) suggests that AI applications in this sector are integrated across multiple real estate domains rather than being confined to a single specialisation.

The use of AI in investment appraisal received an aggregate mean of 3.25, demonstrating its increasing relevance in analyzing market trends and supporting investment decision-making. The highest-ranked application, "identifying patterns and trends not obvious to analysts" (3.64), highlights AI's potential to enhance data analytics in real estate investments. This aligns with global practices where AI models are increasingly used for market forecasting, risk assessment, and investment optimization (Ghosh et al., 2022). However, the relatively lower ranking of "AI in feasibility and viability assessments" (2.73) suggests that while AI enhances data analysis, its adoption in investment risk evaluation remains limited, possibly due to concerns about the reliability of AI-generated financial projections in complex and dynamic markets.

AI's application in real estate auctions ranked fourth, with an aggregate mean of 3.20. The highest-rated aspect, "AI chatbots promoting widespread auction information" (3.69), indicates that AI-powered customer service tools are increasingly used to enhance market accessibility and auction participation. This could facilitate real-time bidding and market transparency (Parker & Adams, 2023). However, lower rankings for AI's ability to predict probable bid sale prices (3.02) and forecast income to sellers (2.95) suggest skepticism regarding AI's predictive accuracy in fluctuating auction environments.

Despite its importance, property valuation recorded the lowest aggregate mean (3.12), indicating that AI adoption in valuation processes is still developing. AI's role in analyzing large data using algorithms (3.70) was acknowledged, aligning with global advancements in automated valuation models. However, the significantly lower score of "AI used only in property valuation" (1.91) suggests that AI is not yet perceived as a standalone valuation tool but rather as a complement to human expertise. This reflects broader concerns about the interpretability and accuracy of AI-generated property valuations, particularly in dynamic markets with diverse economic, environmental, and regulatory factors (Smith et al., 2022).

The results highlight AI's transformative impact on the real estate industry, with its applications in marketing, property management, and investment appraisal being the most widely recognised. These findings align with global developments where AI-driven technologies are reshaping real estate transactions, improving operational efficiency, and enhancing market analytics (Cheng et al., 2023). However, the relatively lower adoption of AI in valuation and auction pricing predictions suggests that industry stakeholders may still require greater confidence in AI's ability to produce reliable and explainable results.

Future advancements in AI, particularly in machine learning, predictive analytics, and natural language processing, could further improve AI's accuracy and trustworthiness in real estate valuation and investment feasibility assessments. Additionally, regulatory frameworks and ethical considerations must evolve alongside technological innovations to ensure transparency, fairness, and security in AI-driven real estate applications.

Insert Table 6 here

Table 6 presents the results of the perceived limitations of using AI in real estate services. The response rate shows that all the perceived limitations with mean values greater than 3.00 and relative importance index of not less than 0.65 are important. This study shows that the application of AI in the real estate industry can be limited by "poor internet (ICT) infrastructure", "erratic power supply, lack of adequate data for viability appraisal, need for continuous education and training, lack of adequate data for valuation purposes, need for continuous monitoring and improve in AI system and lack of technical know-how.

Conclusion

This study assesses the application of AI in real estate practice, focusing on identifying areas of AI application, evaluating its benefits, and evaluating the potential limitations hindering its adoption within the Nigerian real estate sector. Using Benin City as a case study, the research provides insights into how AI can enhance efficiency, accuracy, and decision-making in real estate investment, valuation, marketing, and property management. The study adopted a quantitative research design, utilizing a structured questionnaire to collect data from real estate professionals, including Estate Surveyors and Valuers, property managers, and real estate agents. The collected data were then analyzed to arrive at the findings for the study.

The findings revealed that AI is increasingly recognized as a transformative tool in real estate practice, with its application spanning property valuation, investment appraisal, real estate agency, marketing, and property management. The study identified key benefits such as improved accuracy in property valuation, enhanced efficiency in real estate operations, predictive property maintenance, and better customer service experiences. However, significant limitations were also highlighted, including poor ICT infrastructure, erratic power supply, inadequate real estate data for AI-driven appraisals, and the need for continuous education and training among real estate professionals. Based on the research findings, it can be concluded that AI has the potential to revolutionize the Nigerian real estate sector if strategically integrated. The adoption of AI tools can drive accuracy, time efficiency, and customer satisfaction, making real estate operations more

data-driven and transparent. However, for AI implementation to be successful, there is a need for a concerted effort among industry stakeholders to address infrastructure deficits and skill gaps that hinder seamless AI adoption.

This study highlights the urgent need for real estate practitioners to integrate AI into their daily operations to improve efficiency, reduce errors, and enhance decision-making. AI applications in valuation, marketing, and investment appraisal can optimize property pricing, improve customer engagement, and streamline property management processes. Policymakers must also create a regulatory framework that ensures ethical AI deployment, protects data privacy, and enhances cybersecurity. Additionally, the findings indicate that significant investment in digital infrastructure, such as stable internet connectivity and reliable power supply, is required to maximize AI adoption. Theoretically, this study contributes to the growing discourse on the digital transformation of real estate by providing empirical evidence on the role of AI in the sector. It builds on existing research by demonstrating the practical realities of AI adoption in an emerging market, offering insights into its benefits and constraints. The study also lays a foundation for future scholarly investigations into AI applications in real estate markets within developing economies.

This study encountered several limitations, including a limited geographic scope, as it was confined to Benin City, which may not fully represent the entire Nigerian real estate sector. Additionally, AI adoption in real estate is still evolving, making it challenging to access comprehensive real-time data on its implementation. The reliance on perceptual data from real estate professionals also introduces potential biases in respondents' assessments of AI benefits and limitations. In terms of areas for further research, it is pertinent that future research could explore AI adoption in real estate on a national scale to provide a more comprehensive understanding of its impact. Likewise, longitudinal studies that examine the long-term effects of AI implementation on property valuation accuracy, investment decisions, and market efficiency can also be explored. Further studies could also investigate the role of AI in real estate sustainability and green building practices, as well as how AI can enhance real estate fraud detection and cybersecurity.

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Table 1: Benefits and limitations to the adoption of AI in real estate

	Factors	Sources
Benefits	Increase efficiency in real estate operations	Anderson, Lewis & Springer (2000). Kummerow & Lun (2005). Aroul, Sabherwal, & Villupuram (2022).
	Provide more accuracy in property valuation	Babawale (2013) Abidoye et al., (2021) Abidoye & Chan (2018). Babawale & Omirin (2012)
	Could help reduce corrupt practices in property valuation	Lorenz & Lützkendorf (2008) Nwuba, Egwuatu, & Salawu (2015) Cheloti & Mooya (2021) Adilieme, Abidoye & Lee (2023)
	Improve real estate customer service experience	Palm (2016) Kethley, Waller & Festervand (2002) Ferreira et al., (2023)
	Very easy to adopt and integrate into real estate domain	Lecomte (2019) Oladokun & Aluko (2021) Naeem, Rana & Nasir (2023)
	Enable predictive property maintenance	Razali et al., (2020) Lowin & Mihale-Wilson (2021) Pineda-Montserrat (2024)
	Streamline decision-making process	Sah (2011) Jylhä & Junnila (2014) Sam et al., (2024)
Limitations	Poor internet (ICT) infrastructure	Dixon et al., (2008) Oni (2013) Ihuah, Ekenta & Nwokorie (2014)
	Erratic power supply	Darko., Gadzekpo & Amankwah (2015). Ojo, Oyetunji & Oyetunji (2018). Oyetunji, Ojo & Oyetunji (2018). Ekpo, Orji & Is'haq (2022).
	Inadequate data for property appraisal	Bello & Babajide (2005). Ekemode & Ogunba (2014) Ashaolu & Olaniran (2016). Jagun (2020).
	Needs continuous education and training	Poon, Hoxley & Fuchs (2011). Oladokun (2012). Poon (2014). McGrath et al., (2020).
	Lack of adequate data for property valuation purposes	Ajibola & Ogungbemi (2011). Baffour Awuah et al, (2017). Abidoye & Chan (2018). Oladokun & Mooya (2024).

	Needs continuous monitoring and improvement	Aydın (2004). Njenga (2016). Siniak et al., (2020). Obinna & Udo (2022).
	Lack of technical know-how	de Vries, De Jonge & Van Der Voordt, (2008). Fong & Fung Lee, (2009). Owojori & Okoro (2021).

Table 2: Reliability test

Measures	Cronbach's Alpha	Reliability Interpretation
Perceived Benefits of AI	0.728	Acceptable (≥ 0.7)
Areas of AI Application	0.754	Acceptable (≥ 0.7)
Perceived Limitations of AI	0.925	Excellent (≥ 0.9)

Table 3: Demographics, awareness and application of AI in real estate practice

Questions	Options	Frequency (%)
What is your level of professional qualification in the Nigerian real estate sector?	Probationer	2(3.13)
	Associates (<10years)	16(25.00)
	Associates (>10years)	28(43.75)
	Fellow	18(28.13)
	Total	**64(100.00)**
How many years of experience in real estate practice do you have?	Below 5years	5(7.81)
	5-10 years	13(20.31)
	10years and above	46(71.88)
	Total	**64(100.00)**
Are you aware of the concept of AI?	Definitely yes	48(75.00)
	Probably yes	10(15.63)
	Neutral	4(6.25)
	Probably not	2(3.13)
	Definitely not	0(0.00)
	Total	**64(100.00)**
Do you think AI can be applied in real estate practice?	Definitely yes	36(56.25)
	Probably yes	14(21.88)
	Neutral	9(14.06)
	Probably not	0(0.00)
	Definitely not	6(9.38)
	Total	**64(100.00)**
Do you use AI in providing real estate services in your firm?	Definitely yes	0(0.00)
	Probably yes	5(7.84)
	Neutral	7(10.94)
	Probably not	22(34.34)
	Definitely not	30(46.88)
	Total	**64(100.00)**

Table 4: Perceived benefits of deploying AI in real estate practice

Benefits	SA	A	M	D	SD	Σfx/Σf	RII	Rank
	5	4	3	2	1			
increase efficiency in real estate operations	23	7	24	7	3	4.02	0.80	1st
provide more accuracy in property valuation	23	16	11	4	10	3.59	0.72	2nd
could help reduce corrupt practices in property valuation	18	10	19	16	1	3.43	0.69	3rd
improve customer service experience	12	16	21	6	9	3.25	0.65	4th
very easy to adopt and integrate into real estate domain	12	21	11	6	14	3.17	0.63	5th
enable predictive property maintenance	10	12	16	11	13	2.83	0.57	6th
streamline decision-making process	8	10	20	5	12	2.53	0.51	7th

Table 5: Areas of AI application in real estate practice

Areas of application	Sub-areas of its application	SA 5	A 4	M 3	D 2	SD 1	Σfx/Σf	RII	Rank	Agg. Mean	Rank
Real Estate Agency/ Marketing	aids in property search	20	30	9	3	3	4.00	0.80	1st	3.46	1st
	enhance remote property marketing/inspection	28	14	11	5	1	3.75	0.75	2nd		
	helps in forecasting property growth rates over time	16	17	14	5	22	3.47	0.69	3rd		
	chatbots provide easy access to customer support	13	15	18	10	8	3.23	0.65	4th		
	used in property marketing only	16	7	8	17	16	2.84	0.57	5th		
Property management	planned maintenance/repair schedule	15	25	11	6	7	3.55	0.71	1st	3.29	2nd
	predict rent over time	17	16	19	8	5	3.55	0.71	1st		
	automate maintenance scheduling	17	15	20	6	8	3.52	0.70	3rd		
	assist renters find properties that meet their criteria	17	17	13	11	6	3.48	0.70	4th		
	predict rental growth rate over time	12	20	22	7	3	3.48	0.70	4th		
	automate rent collection	14	25	7	11	7	3.44	0.69	6th		
	used only in property management only	5	0	11	24	24	2.03	0.41	7th		
Real Estate Investment Appraisal	helps to identify patterns/trends not so obvious to analysts	19	16	17	9	5	3.64	0.73	1st	3.25	3rd
	enhance the accuracy of real estate investment decisions	15	23	17	5	4	3.63	0.73	2nd		
	aid data analysis and forecast real estate investment flow	12	25	15	7	5	3.50	0.70	3rd		
	can predict the future flow of property values	18	14	19	1	9	3.34	0.67	4th		
	analyse real estate performance and economic indicators for making informed decisions	11	19	14	13	4	3.17	0.63	5th		
	used to analyse historical sales data and market trends	10	16	14	7	6	2.75	0.55	6th		
	used in investments feasibility and viability assessments	7	15	9	19	15	2.73	0.55	7th		
Real Estate Auction	AI chatbots promote widespread information of auction	20	23	10	4	6	3.69	0.74	1st	3.20	4th
	set benchmark price for auction	4	24	23	10	4	3.17	0.63	2nd		
	set general conditions for auction	4	18	30	9	3	3.17	0.63	2nd		
	helps forecast probable bid sale price	2	20	30	2	9	3.02	0.60	4th		
	helps forecast probable income to the seller	3	13	34	6	8	2.95	0.59	5th		
Property Valuation	analyse large data using AI algorithm	22	22	7	6	6	3.70	0.74	1st	3.12	5th
	improve speed and efficiency	27	12	8	7	11	3.63	0.73	2nd		
	produce more precise valuation results	9	19	21	8	7	3.23	0.65	3rd		
	it can be used in property valuation only	12	1	14	10	14	1.91	0.38	4th		

Table 6: Perceived limitations to the use of AI in real estate practice

Limitations	SA	A	M	D	SD	Σfx/Σf	RII	Rank
	5	4	3	2	1			
Poor internet (ICT) infrastructure	24	20	6	12	4	4.22	0.84	1st
Erratic power supply	26	15	17	4	2	3.92	0.78	2nd
Inadequate data for property appraisal	30	14	5	14	1	3.91	0.78	2nd
needs continuous education and training	28	19	4	0	10	3.72	0.74	4th
Lack of adequate data for property valuation purposes	23	13	7	16	5	3.52	0.70	5th
needs continuous monitoring and improvement	17	24	7	3	13	3.45	0.69	6th
Lack of technical know-how	22	13	6	6	15	3.23	0.65	7th