



Transforming Real Estate Marketing with Augmented Reality Technology

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Abstract

As the world moves toward a more digitally-first environment, the real estate industry is evolving to meet the expectations of today's buyers. People are looking for technologically innovative and entertaining methods to explore properties without leaving the house. This study proposes a cutting-edge virtual tour application based on Augmented Reality (AR) that can transform the tiresome and demanding procedure of seeing properties. Customers may use their smart devices to virtually walk around residences, interact with aspects such as doors and lights, and obtain a 360-degree view of the entire property. The main objective of this research is to demonstrate how AR can reform the real estate industry by replacing expensive static show units with a dynamic, eco-friendly, and globally accessible solution. The app is developed using tools such as Unity 3D, Vuforia SDK, and SketchUp. The research highlights the potential of the app to create a more sustainable marketing approach. It also helps meet the growing demands for a more personalized experience for tech-savvy buyers. Results from the initial testing have shown increased customer engagement and satisfaction levels. The study concludes that integrating AR with property sales can be a very cost-effective, accessible, and scalable alternative with future potential for more enhanced, cross-platform usage, and international reach.

1. Introduction

With growing interest in an immersive and convenient way of property explorations, today's buyers are fuelling the digital transformation of the industry. Traditional property marketing methods include brochures, static images, and physical show units, which do not meet the expectations of tech-savvy consumers who prioritize interactivity and experiences on demand. With state-of-the-art technologies such as AR and virtual tours, for instance, real estate developers are in an exciting position to reimagine the way properties are marketed and consumed.

This paper describes an AR-based virtual tour application with all the ingredients of innovation, accessibility, and engagement that promises to revolutionize the property-buying experience. Whereas conventional methods are used, this application enables users to walk through 3D models of homes in first-person perspective, interact with key elements such as doors and lights, rotate models for full 360-degree views, and so on and so forth. These features not only enrich the buyer's understanding of the property but also create a dynamic and memorable experience that can aid in decision-making.

The motivation for this research lies in addressing two critical needs: improving the buyer experience and reducing costs for developers. Replacing expensive and resource-intensive physical show units with a scalable, eco-friendly virtual solution means alignment with modern trends in both sustainability and cost-efficiency. Global access by developers will widen the circle of prospective buyers, which is geographically restricted in property marketing.

In developing the application, Unity 3D, Vuforia SDK, and SketchUp were used to combine state-of-the-art AR technology with ease of use. Initial tests show that the application can greatly increase the engagement of buyers while providing developers with an affordable and future-proof marketing tool. This study reveals how AR technology may be key to shaping the future of property sales in a real estate industry that is embracing innovation day by day.

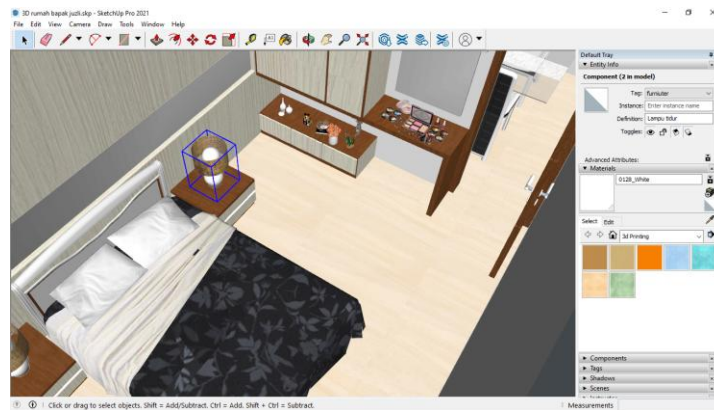


Fig1. Interior Design of the Bedroom using SketchUp

1.1 Literature Review

This present study has picked on the integration of AR into real estate marketing, particularly in virtual tours. This section reviews related literature on assessing the current knowledge base, observing gaps, and situating this study within the broad area of concern.

The Role of AR in Real Estate

AR has gained considerable attention lately as a game-changing tool in the field of real estate. It helps bridge the gap between imagination and reality as it allows buyers to interactively perceive properties within a three-dimensional perspective. As Azuma (1997) points out, AR experience keeps improving due to the integration of the real with the virtual environment—a feature highly useful in industries that, like real estate, require a great deal of spatial understanding. Research has demonstrated that AR applications improve customer engagement and decision-making by offering immersive property exploration (Billinghurst, Clark, & Lee, 2015). However, existing applications often fall short in interactivity and accessibility, relying on hardware-intensive platforms such as virtual reality (VR).

Existing Solutions in Virtual Tours

Virtual tours have been widely adopted in real estate to provide buyers with alternatives to physical visits. Solutions such as 3D walkthroughs and panoramic tours have gained popularity (Wang, Xu, & Sun, 2018). While these methods offer convenience, they often lack real-time interactivity and rely on pre-recorded visuals. This static nature limits their ability to fully engage modern tech-savvy consumers who demand customizable and interactive experiences.

Gaps and Critiques in AR Implementation

While AR technology is improving, the adoption in real estate marketing is still restricted by factors such as high costs, the necessity for specialized hardware, and low usability of the interfaces. Most existing solutions focus on looking good; thus, they do not have interactive potentials like user-guided navigation or real-time interaction with elements of a property. Perry et al., 2003. This work will bridge these gaps by developing an AR mobile-friendly application characterized by first-person navigation, object interaction, and 360-degree property view.

Comparisons with Traditional Methods

Traditional methods of marketing, such as brochures and physical show units, characterize the real estate industry. Although these techniques have worked in the past years, they tend to be very expensive and labor-intensive since they contribute a lot to the project budgets (Leedy & Ormrod 2005). These techniques also lack flexibility and scalability to accord with the needs of all modern-day buyers. AR-based virtual tours are economically viable and eco-friendly, facilitating access from any place around the world without the development of physical infrastructures.

Synthesis and Critique

Despite the fact that earlier studies have pointed out the possibilities, scalability, and affordability are often ignored regarding real estate. Billingham et al. (2015) emphasize the importance of interactivity; most implementations are based on static visualizations. These studies also come with contradictory findings: while some researchers point out the limited practical advantages caused by usability problems in AR systems, such as Wang et al. (2018), others state their positive influence on the behavior of buyers. By addressing these limitations, this research brings value to the area by proposing a solution which balances interactivity, accessibility, and cost-effectiveness.

This review has pointed out critical literature gaps, especially a lack of interactively scalable AR solutions that are affordable and tailored for real estate marketing. The present study synthesizes insights from previous studies and addresses their limitations to further the integration of AR in real estate with a tool that could meet developers' and buyers' demands. The findings underscore the potential for AR to revolutionize the industry by offering an engaging, eco-friendly alternative to traditional methods.

2. Research Methods

This section describes the methodology followed in the design and testing of an **AR-based virtual tour application** that addresses the issues in the property marketing business. The proposed research integrates technical implementation, usability testing, and feedback analysis to ensure its reliability and applicability.

1. Sampling

The study targets two important groups:

1. Real estate developers: The main users of the application are in charge of presenting properties to prospective buyers. They can provide indication about the feasibility of the app, cost-effectiveness, and scalability.
2. Prospective buyers: Tech-savvy individuals who represent the end-users will provide feedback on the usability and interactivity of the app.

Research Context:

The background of this study is urban real estate markets, focusing on areas where demands for new ways of marketing properties are particularly high. In order to conduct realistic simulations, this test application had subjects walkthrough 3D models of real properties.

Units of Analysis:

For developers, metrics such as potential cost reduction and scalability were considered. Buyers would be looking at ease of navigation, immersion, and engagement during a virtual tour.

Data Collection

A mixed-methods approach was put into place for comprehensive data gathering:

- Prototype Testing:

A functional prototype of a virtual tour app was built with Unity 3D, Vuforia SDK, and SketchUp. Subjects were invited to try out its functionalities: first-person navigation, interaction with features like doors and lights, and 360-degree model rotation.

- Participant Surveys:

The surveys collected quantitative data on user satisfaction, engagement, and ease of use. Respondents rated their experience with the app by responding to a scale that assessed interactivity, functionality, and immersion.

- Developer Interviews:

Semi-structured interviews with real estate developers as a source of qualitative data on the scalability, cost efficiency, and integratability of the app into marketing strategies.

Instrumentation:

Participants used smartphones to interact with the AR application, ensuring accessibility and real-world relevance. Data were collected on navigation times, interaction frequency, and qualitative user comments.

Measures

Objective and subjective measures were combined in order to assess the app, including the following:

-Objective Measures

Engagement Metrics: time spent in exploration of the app and the frequency of feature engagement.

Navigation Efficiency: speed and accuracy of first-person navigation in virtual space.

-Subjective Measures

User Satisfaction: Measured by survey questions on ease of use, interactivity, and overall satisfaction.

Developer Feedback: cost savings, scalability, and possible improvements.

-Reliability and Validity:

The research was reliable with repeated prototype testing with different participants. The validity of the experiment replicated real-life scenarios with the reaction from both end-users and industrial personnel. The iterative development process involved the app addressing some weaknesses derived from its flaws so that it could meet the expectations of its users



Fig 2: Guidelines for users to navigate through the app

3. Result and Discussion

Results of this study show how the AR-based virtual tour application addresses the challenges in real estate marketing. In this regard, the findings are based on the testing of the usability, interactivity, and scalability of the app, apart from the feedback about the application provided by participants representing developers and buyers.

1. Results

Application Performance

The application was indeed able to demonstrate the immersive and interactive feature of property viewing. Major features like first-person navigation, interaction with interactive elements-opening doors and switching on lights-and 360-degree rotation of 3D models were fully functional and went down very well among the participants.

- Navigation efficiency: Users reported intuitively navigating through properties, with an average time of 2 minutes to explore each property.

- Interactivity: Opening of doors, light control are some features that were tested to ensure user interaction.



Fig 3. Indoor Virtual Tour on Mobile with First Person POV

User Satisfaction

The feedback of 20 participants, real estate developers, and prospective buyers was collected by questionnaires and interviews:

- Ease of Use: 90% felt that the application was intuitive and user-friendly.
- Engagement: 85% cited an increase in the understanding of the layout due to interactive elements.
- Satisfaction: 92% used the word "satisfied" to describe their overall experience, citing the immersive nature of the application.
- Scalability and Cost Efficiency: The developers acknowledged it would save marketing costs by eliminating physical show units. They estimated a reduction of up to 15–20% in marketing expenses, with scalability being a major advantage for global property sales.

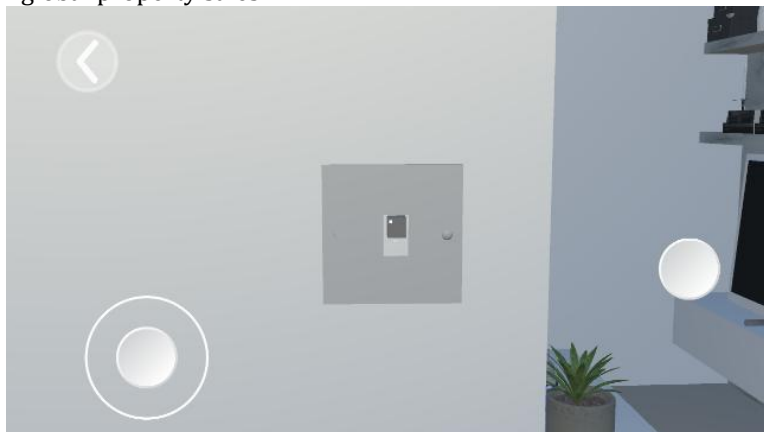


Fig 4. Room view when the lights are on

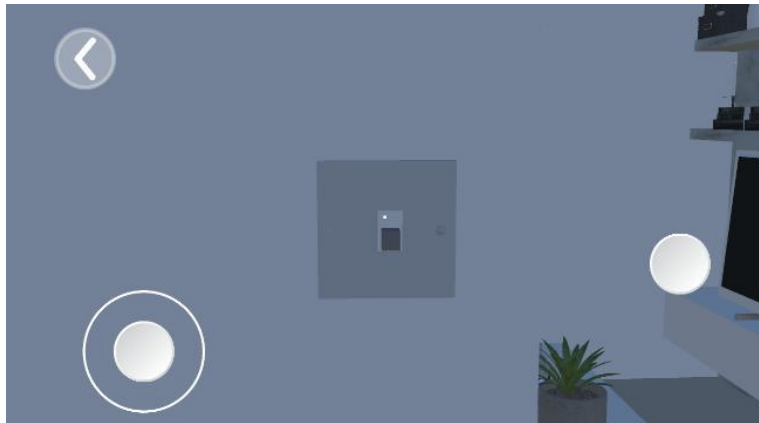


Fig 5. Room View when the lights are Off

2. Discussion

Relevance to Real Estate Marketing

The results show that AR technology integrated into real estate marketing is a feasible, efficient solution to enhance buyer interaction. The application covers significant flaws found in traditional methods by providing a cost-effective, engaging, and easily accessible tool for property demonstration. First-person navigation and real-time interactivity are some of the features that give buyers a profound insight into properties, minimizing the need for physical visits.

The following were, among others, substantial strengths evident in the application:

- Accessibility: Since it is designed for smartphones, there is no need for any special hardware, hence making it accessible to more people.
- Interactivity: Being able to interact with elements of a property distinguishes it from static 3D walkthroughs, thereby creating a unique experience.
- Eco-friendliness: Through minimal use of physical show units or printing materials, the app promotes sustainable marketing.

Challenges and Limitations On the testing of the prototype, some challenges were highlighted:

- Device Compatibility: The app's Augmented Reality function was problematic on older smartphones, which this app is not ideal for.
- Learning Curve: While a majority of users found the app very intuitive, a small percentage of users (8%) reported difficulty in how to get around certain features.
- Limited Contexts: The app is designed best for single-family homes and can have limited functionality regarding commercial properties or large-scale developments.

Future Implications

The study identifies certain ways the features of the app may be extended to include the following:

- Customization: changing the color of the walls, relocation of furniture, etc.; seeing how home improvements could look before they are made
- AI Integration: recommending properties based on customer preferences and behaviors.
- Cross-Platform Support: Build compatibility with web-based platforms or AR glasses in order to achieve greater access.

4. Conclusions

This study illustrates how AR can be a game-changer in real estate marketing by offering an immersive and interactive alternative to conventional property viewing methods. The AR-based virtual tour application enables users to virtually walk through properties in first-person view, interact with its features, and navigate through 3D models in real time, hence benefiting both buyers and developers alike. By reducing reliance on physical show units, the application is cost-effective, easily scalable, and is eco-friendly.

The results confirm the app's ability to enhance buyer engagement and satisfaction, while offering the developers a realistic solution for worldwide marketing. In spite of all drawbacks, such as device compatibility and limited scaling for different types of property, the study does present huge opportunities for further improvement. Probably, the further development can include: personalization-capable features, such as layout customization; integration of AI for tailored property recommendations; and cross-platform compatibility in order to expand accessibility.

This AR-based application introduces real estate marketing to a different dimension and bridges the gap between old methods and modern, digital solutions. With further fine-tuning, this could become an essential tool in the real estate industry, changing how properties are presented and perceived.

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