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From Visualization to Purchase: How Augmented Reality (AR), Virtual Reality (VR) and Artificial Intelligence (AI) Influence Consumer Purchase Decisions in Housing Design Decisions

Meet Dave[1]; Palak Gupta[2]; Aastha Gandhi[3]; Bhakti Sejpal[4]

[1,2,3,4] Institute of Management, Nirma University, Ahmedabad, Gujarat India

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Abstract: The integration of digital technologies has revolutionized consumer experiences across industries, particularly in the real estate and housing design sectors. Technologies such as Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI) have enabled consumers to visualize and personalize housing designs with greater precision and engagement. These technologies enhance the consumer decision-making process by offering immersive design exploration, interactive customization, and data-driven recommendations that align with individual preferences. This study investigates the impact of AR, VR, and AI on consumer purchase decisions in the housing design context, focusing on the perceived usefulness and ease of use of these technologies. A quantitative research methodology was employed, using structured questionnaires distributed to more than 300 respondents familiar with AR, VR, or AI applications in housing design. Statistical analyses, including one-way ANOVA and paired t-tests, were conducted to assess variations in responses based on demographic factors such as income, age, and gender while comparing the relationship between Perceived Usefulness (PU) and Perceived Ease of Use (PEU) across the three technologies. The findings from this study provide valuable insights for real estate professionals, interior designers, and marketers seeking to leverage these technologies to enhance consumer engagement and optimize purchase decisions. By understanding how different demographic segments perceive and adopt AR, VR, and AI, businesses can refine their marketing strategies, technology offerings, and customer experiences to align with evolving consumer preferences and technological advancements.

Keywords: *Augmented Reality (AR) - Virtual Reality (VR) - Artificial Intelligence (AI) - Consumer Purchase Decisions - Housing Design Technologies - Real Estate Marketing - Perceived Usefulness – Perceived Ease of use.*

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I. INTRODUCTION

The rapid development of digital technologies has drastically changed how consumers interact with brands, especially in the retail and marketing sectors. The three most important developments are artificial intelligence (AI), virtual reality (VR), and augmented reality (AR). Each of these technologies has unique features that improve customer experiences: AR adds digital data on the real world to improve product visualization; VR transports users to virtual worlds, encouraging more intense emotional interaction; and AI uses data to provide recommendations that are specific to each user's preferences.

These technologies are changing the way consumers interact with brands in the modern marketing landscape, especially in the house design industry. These developments have the potential to fundamentally alter how buyers envision, interact with, and ultimately decide which homes and interior designs to buy. Particularly, AR provides users with a highly engaging experience by superimposing virtual things over the real world. Homebuyers' decision-making process is influenced by VR's ability to generate completely immersive surroundings and AI's ability to use data to offer tailored design recommendations. For instance, consumers can virtually arrange furniture in their homes using apps like IKEA Place, which helps users make decisions with less uncertainty (Azuma, 1997; Chylinski et al., 2020).

Initially developed for military uses, Armstrong Laboratories made the first major advancement in AR technology in 1990. However, it quickly found use in a variety of civilian areas, such as retail and design (Azuma 1996). Customers can virtually arrange furniture, select wall

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colors, and design entire rooms with AR applications, greatly increasing their confidence in their purchase decisions. This growing consumer engagement with AR highlights the potential of these technologies in housing design (Lee, J. H., & Kim, S. I. (2019).; Yim, M. Y., Chu, S. C., & Sauer, P. L. (2020)). These days, AR-enabled mobile applications (MAR apps) give customers the ability to see things in actual locations, making shopping more useful and engaging. Apps such as IKEA's MAR app and Amazon AR View, for instance, allow consumers to place digital furniture in their homes to see how it fits and looks. This increases decision-making and removes a lot of uncertainty (Loureiro et al., 2019; Rauschnabel et al., 2019). With the ability to seamlessly integrate digital information with physical surroundings, these tools, when combined with AI's individualized recommendations, have the potential to completely transform how consumers approach interior design and housing (Chylinski et al., 2020).

The purpose of this study is to explore how AR, VR, and AI affect customer choices regarding housing design by looking at how these technologies affect consumers' decision-making at different phases. In particular, our research will look into how AR apps assist users in visualizing design components, how VR improves the whole experience by simulating immersive environments, and how AI-powered suggestions influence product choices. In order to improve customer happiness and encourage buy behaviour, companies can successfully incorporate these technologies into their marketing campaigns by knowing these factors.

II. LITERATURE REVIEW

The integration of Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI) in the real estate sector represents a significant shift in how consumers interact with housing design and make purchasing decisions. These technologies offer immersive, interactive, and personalized experiences that influence consumer behavior and decision-making processes. This comprehensive literature review synthesizes current research on the influence of AR, VR, and AI on consumer purchase decisions in housing design, providing in-depth insights and managerial perspectives on the implications of these technologies in the real estate market.

➢ *Virtual Reality (VR) In Real Estate*

- *Overview of Virtual Reality (VR)*

Virtual Reality (VR) creates fully immersive digital environments that users can explore, offering a profound impact on how consumers perceive and interact with real estate properties. VR allows potential buyers to experience properties remotely, providing a realistic sense of space and design that traditional methods cannot match.

- *Enhancing Consumer Experience*

Azmi et al. (2021) highlight that VR can significantly influence potential homebuyers' emotions and purchase intentions by creating immersive experiences that evoke strong emotional responses. The ability to virtually tour properties allows consumers to make more informed decisions and increases their confidence in their choices. Baiying and Chonlavit (2024) emphasize the importance of VR in interior design, where consumers can visualize and interact with design elements, enhancing their engagement and satisfaction.

- *Emotional and Cognitive Engagement*

Deep et al. (2023) demonstrate that VR technologies can expedite the evaluation process in real estate investments by providing detailed and realistic property visualizations. This not only enhances cognitive engagement but also fosters emotional connections with the property, making the buying process more enjoyable and convincing. Enyejo et al. (2024) further support this by showing how VR experiences can lead to higher levels of customer satisfaction and brand loyalty through immersive product interactions.

➢ *Augmented Reality (AR) In Real Estate*

- *Overview of Augmented Reality (AR)*

Augmented Reality (AR) superimposes digital information onto the real world, enhancing the user's perception and interaction with their environment. In real estate, AR is used to create interactive and detailed visualizations of properties, allowing consumers to visualize how different design elements will fit into their homes.

- *Enhancing Purchase Intent*

Ganapathy (2016) discusses the use of AR in making real estate transactions smoother and more transparent, ultimately improving the buying experience and increasing purchase intention. Ibrahim et al. (2023) found a significant correlation between AR attributes and purchase intention, suggesting that AR can effectively promote property sales by providing potential buyers with a holistic view of the product. Liu, Balakrishnan, and Saari (2024) explore how AR technology improves consumer confidence and purchase intent by allowing users to visualize products in a real-world context, reducing the likelihood of returns and increasing satisfaction.

- *Personalized Shopping Experience*

Saeed et al. (2024) developed an e-commerce platform for furniture that combines AR with AI-driven 3D modeling and dynamic pricing tools, providing a seamless shopping experience. This integration allows consumers to visualize products in their own space, receive personalized recommendations, and access accurate pricing information. Rauschnabel et al. (2022) emphasize the various applications of AR in marketing and its impact on consumer behavior and purchase decisions.

➢ *Artificial Intelligence (AI) In Real Estate*

- *Overview of Artificial Intelligence (AI)*

AI encompasses a range of technologies that enable machines to simulate human intelligence. In real estate, AI is used for predictive analytics, automated customer service, and personalized recommendations, significantly impacting consumer decision-making processes.

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- *Predictive Analytics and Market Trends*

Miljkovic et al. (2023) discuss how AI can predict market trends and property values, aiding real estate professionals and consumers in making informed decisions. AI-driven tools analyze large datasets to provide insights into future market conditions, helping buyers and sellers strategize effectively. Nalbant and Aydin (2023) highlight the role of AI in enhancing customer engagement and improving marketing strategies in the digital age.

- *Personalized Recommendations*

Zimmermann et al. (2022) explored the use of AI in creating personalized shopping experiences through augmented reality shopping assistants. These assistants use AI to provide tailored recommendations, enhancing the shopping experience and increasing the likelihood of purchase. Seagraves (2023) discusses the benefits and challenges of AI integration in real estate, emphasizing its potential to improve decision-making processes and enhance customer experiences.

➢ *Integration of AR, VR, and AI in Real Estate*

- *Enhanced Consumer Experience*

The integration of AR, VR, and AI technologies creates a synergistic effect that significantly enhances the consumer experience in the real estate sector. These technologies provide immersive, interactive, and personalized engagements that traditional methods cannot match. Saeed et al. (2024) developed an e-commerce platform for furniture that combines AR, AI-driven 3D modeling, and dynamic pricing tools to provide a seamless shopping experience. This integration allows consumers to visualize products in their own space, receive personalized recommendations, and access accurate pricing information. Sung et al. (2021) found that the quality of AI in mixed reality environments enhances consumer engagement and increases purchase intentions. The immersive and interactive nature of AR and VR, combined with the intelligence of AI, creates a compelling case for their use in real estate marketing.

➢ *Impact On Purchase Decisions*

- *Consumer Behavior*

The combined use of AR, VR, and AI technologies has been shown to positively influence purchase decisions. Tang et al. (2023) investigated the use of AR and VR technology in interior design education, highlighting how these technologies enhance student learning and engagement, which can be translated into real-world applications for consumer behavior. Tomlinson et al. (2022) found that VR environments increase consumer engagement and purchase intentions by providing immersive and interactive shopping experiences. Tran and Ha (2024) conducted a systematic review of AR and VR applications in tourism, demonstrating the benefits of these technologies in enhancing the travel experience and promoting sustainable tourism practices.

- *Decision-Making Process*

Wonsik and Sejin (2023) explored the impact of VR commerce on consumer purchase decisions, finding that VR experiences significantly influence consumer behavior and purchase intentions by providing immersive and interactive shopping environments. Yim et al. (2017) discussed the effectiveness of AR technology in e-commerce, emphasizing how interactivity and vividness perspectives impact consumer engagement and purchase intentions. Youn and Kim (2024) examined the role of AR in enhancing consumer engagement and purchase intention in the furniture retail industry, showing that AR technology significantly improves consumer experiences and increases the likelihood of purchase.

- *Real Estate Applications*

Zhu and Xiao (2024) investigated the role of AR and VR technologies in enhancing consumer purchase intention in the real estate industry, highlighting the benefits of these technologies in providing immersive and detailed property visualizations, leading to higher consumer satisfaction and purchase intention. Taro et al. (2018) examined the use of immersive VR to improve customer experience in retail environments, showing that VR can lead to higher levels of consumer engagement and satisfaction, ultimately influencing purchase decisions.

➢ *Challenges and Future Directions*

- *Technological Limitations*

Despite the promising potential of AR, VR, and AI technologies, significant challenges exist for their widespread adoption. Liu, Balakrishnan, and Saari (2024) noted technical issues such as image rendering quality, real-time interaction smoothness, and high technology costs as barriers to effective implementation. Additionally, Hsiao et al. (2024) emphasized that while VR technology enhances the immersive shopping experience and improves product profitability, there are limitations related to user demographics, preferences, and overall user experience.

- *Market Acceptance*

For AR, VR, and AI to be fully integrated into the real estate sector, market acceptance is crucial. Deep et al. (2023) and Sihi (2018) highlighted the importance of consumer adoption and the readiness of real estate professionals to embrace these technologies. Effective marketing and education strategies are needed to demonstrate the benefits of these technologies and alleviate any concerns regarding their use.

- *Future Prospects*

The future of AR, VR, and AI in real estate looks promising as technological advancements continue to evolve. Rane et al. (2023) discussed the integration of AI, blockchain, IoT, AR, and VR in sustainable tourism development, highlighting the potential for these technologies to transform various industries, including real estate. As these technologies become more sophisticated and accessible, their integration into the real estate market is expected to grow, offering significant benefits to both consumers and professionals.

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The integration of AR, VR, and AI technologies in the real estate sector has a profound impact on consumer purchase decisions in housing design. These technologies enhance the consumer experience by providing immersive, interactive, and personalized engagements that traditional methods cannot match. While challenges exist for their widespread adoption, the future holds great potential for these technologies to revolutionize the real estate industry. As technology continues to advance, the integration of AR, VR, and AI will likely become a standard practice in real estate marketing, offering significant benefits to both consumers and professionals. By synthesizing the findings from various studies, this literature review provides a comprehensive understanding of the current state of AR, VR, and AI technologies in the real estate sector and highlights their transformative potential in enhancing consumer experiences and influencing purchasing decisions.

III. RESEARCH GAP

Despite extensive studies on Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI) concerning consumer behaviour, existing literature primarily focuses on their impacts. Most research examines these technologies in isolation, overlooking their potential combined influence across the prepurchase process. The prepurchase stages—comprising need recognition, information search, evaluation of alternatives, and purchase decision—are crucial for understanding how consumers interact with products and brands before making a final purchase.

What remains unclear is how AR, VR, and AI differentially affect these distinct stages and whether integrating them could optimize consumer engagement and decision-making. Furthermore, while previous studies provide valuable insights into how each technology impacts overall consumer behaviour, they do not dissect the unique contributions of AR, VR, and AI across these prepurchase stages. Given the growing integration of these technologies into marketing strategies, a comparative analysis is necessary to understand their unique and combined roles. Moreover, current research has predominantly focused on Western markets, providing limited attention to diverse socio-economic contexts such as the Indian market. This presents a unique opportunity to explore how cultural dynamics influence consumer behaviour with these technologies. Therefore, a rigorous exploration into the comparative impact of AR, VR, and AI is essential not only to fill this academic void but also to equip marketers with a nuanced understanding of how to implement these technologies effectively in diverse consumer demographics.

India's housing market is distinct because of its varied population, subtle cultural differences, and financial limitations. Indian customers are depending more and more on technology to make educated decisions because of the digital change that has occurred in the interior design and real estate industries. In contrast to established economies, the use of AR, VR, and AI in house design is still in its infancy. The technological potential of AR, VR, and AI is the focus of current studies, but their behavioral and psychological effects on Indian customers throughout the purchasing process are not fully understood.

There is little information on how AR and VR affect house design choices, despite research in other fields examining the cognitive and affective effects of these technologies on customers. For example, what emotional reactions do Indian buyers have to AR/VR representations of possible properties, and how does this influence their intention to buy? What part does AI play in tailoring design choices to suit Indian tastes? how Indian home designers and developers are integrating AR, VR, and AI into their business plans?

IV. RESEARCH OBJECTIVES

The integration of Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI) has revolutionized the real estate sector, particularly in influencing consumer purchase decisions related to housing design and aesthetics. These technologies offer immersive and interactive experiences that traditional methods cannot match, significantly impacting consumer behavior and decision-making processes. To understand the full extent of these impacts and to identify which technology offers the most substantial benefits, we outline the following research objectives:

➢ *Objectives*

- *To understand the impact of AI, AR, and VR on purchases relating to housing aesthetics.*

This objective aims to explore how AI, AR, and VR technologies influence consumer perceptions and decisions regarding the aesthetics of housing. By examining the specific ways these technologies enhance the visualization, personalization, and emotional engagement with housing designs, we can better understand their roles in the purchasing process.

- *To compare the three technologies—AI, AR, and VR—and analyze which of these creates a superior impact on purchase decisions.*

This objective seeks to evaluate and compare the effectiveness of AI, AR, and VR technologies in influencing consumer purchase decisions. By analyzing the strengths and weaknesses of each technology, we aim to identify which one has the most significant impact on consumer behavior and why, providing insights for real estate professionals to optimize their marketing and sales strategies.

V. RESEARCH HYPOTHESIS

To explore the influence of AR, VR, and AI on consumer purchase decisions in the housing aesthetics industry, we have formulated the following hypotheses. These hypotheses aim to test the impact of these technologies on consumer behavior and their purchasing inclinations. By examining these relationships, we seek to provide a

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comprehensive understanding of how these emerging technologies are reshaping the real estate market.

➢ *Hypothesis One*

- H0: Consumer purchase decisions are not significantly impacted by AR in the housing (aesthetics) industry.
- H1: Consumer purchase decisions are significantly impacted by AR in the housing (aesthetics) industry.

➢ *Hypothesis Two*

- H0: Consumer purchase decisions are not significantly impacted by VR in the housing (aesthetics) industry.
- H1: Consumer purchase decisions are significantly impacted by VR in the housing (aesthetics) industry.

➢ *Hypothesis Three*

- H0: Consumer purchase decisions are not significantly impacted by AI in the housing (aesthetics) industry.
- H1: Consumer purchase decisions are significantly impacted by AI in the housing (aesthetics) industry.

➢ *Hypothesis Four*

- H0: There is no positive relation between the usage of technologies (AR, AI, and VR) by housing companies and the inclination towards purchases by consumers.
- H1: There is a positive relation between the usage of technologies (AR, AI, and VR) by housing companies and the inclination towards purchases by consumers.

VI. RESEARCH DESIGN

The study titled "From Visualization to Purchase: How Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI) Influence Consumer Purchase Decisions in Housing Design Decisions" employed a descriptive research design. The descriptive research design systematically examined the influence of AR, VR, and AI technologies on consumer purchase decisions, focusing on housing design. This design aimed to capture specific characteristics of consumer behavior, such as engagement, usability, and purchase intent, without manipulating technologies.

The study addressed a critical gap in literature by focusing on the Indian housing market and exploring how these technologies facilitated consumer decision-making during the design and purchase stages. The descriptive approach allowed for a detailed analysis of the role and effectiveness of AR, VR, and AI in influencing consumer choices.

➢ *Target Population*

The target population for this study included consumers aged 18–60 who were potential or current homebuyers and were aware of AR, VR, or AI technologies in housing design. This demographic was chosen for its relevance to housing purchase decisions and familiarity with technology-driven tools.

➢ *Sampling Plan*

- *Sample Size*

The sample size for this study exceeded 300 respondents, ensuring robust statistical power and broader generalizability across diverse consumer demographics in housing design decisions. A larger sample size enhanced the reliability of the findings by reducing sampling error and increasing the accuracy of detecting significant differences and relationships between the technologies—AR, VR, and AI—and their influence on consumer purchase decisions. Additionally, a sample size exceeding 300 participants allowed for more detailed subgroup analysis, enabling a deeper understanding of how different demographic groups perceived and adopted these technologies in housing design. This increased sample size strengthened the validity of the study's conclusions and ensured that the results were reflective of a wider population.

- *Sampling Method*

A convenience sampling method was used to recruit participants through personal networks, university contacts, and local housing communities. This approach was practical and cost-effective, ensuring that participants were aware of AR, VR, or AI technologies.

➢ *Methodology*

The quantitative component of this study involved distributing structured questionnaires to a sample size of more than 300 consumers who were familiar with AR, VR, or AI technologies in the context of housing design. The questionnaires consisted of 36 questions, divided into three sections with 12 questions each, focusing on VR, AR, and AI respectively. These questions utilized Likert scale ratings to assess key factors such as consumer engagement, perceived usefulness, ease of use, and emotional response at different stages of the purchase journey. The larger sample size provided a more comprehensive understanding of consumer perceptions and ensured more reliable and statistically valid results, allowing for deeper insights into the influence of these technologies on housing design decisions.

The Technology Acceptance Model (TAM) scale was slightly modified to fit the research context. It was used to assess factors like perceived ease of use and perceived usefulness of AR, VR, and AI technologies in housing design. This modification ensured that the scale was relevant to the specific technologies and the research objectives.

The data collected from the questionnaires were analyzed using statistical tools to draw meaningful insights into how AR, VR, and AI technologies influenced consumer purchase decisions in the housing design industry. From a marketing and business perspective, understanding these insights was essential for real estate companies and marketers aiming to leverage these technologies to enhance consumer experiences and drive sales.

A one-way ANOVA was conducted to evaluate differences across demographic factors such as age, income, and gender, determining how these technologies impacted the

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perceived usefulness and ease of use. Identifying which demographic segments were most receptive to these technologies helped businesses fine-tune their marketing strategies and create targeted promotional campaigns that aligned with consumer preferences.

In addition to ANOVA, a paired t-test was performed for all three sections—VR, AR, and AI—to compare Perceived Usefulness (PU) and Perceived Ease of Use (PEU). This analysis helped identify any discrepancies between how useful consumers found the technologies and how easy they perceived them to be. From a business standpoint, understanding this relationship was critical, as technologies that consumers found both useful and easy to use were more likely to influence their purchase decisions and improve customer satisfaction.

➢ *Key Demographics*

- *Age:*

Younger generations, such as Millennials and Gen Z, were typically more tech-savvy and open to adopting emerging technologies. These segments were more influenced by immersive technologies like VR and AI-driven personalized recommendations. Marketers targeting these groups could emphasize the innovative and interactive aspects of these technologies to boost engagement and conversion rates.

- *Income:*

Higher-income groups had greater purchasing power and were more inclined to invest in premium technologies that enhanced their decision-making experience. VR and AI, which provided immersive experiences and personalized recommendations, resonated more with higher-income consumers. Marketing strategies aimed at these groups highlighted the value proposition of these technologies in making more informed and confident decisions.

- *Gender:*

Gender differences also played a role in technology adoption and usage. Men and women perceived and interacted with these technologies differently, influencing their purchase decisions. Marketers could leverage these insights to design more personalized and inclusive marketing messages that appealed to both male and female consumers, ensuring that the technology's benefits were communicated effectively.

By conducting one-way ANOVA and paired t-tests with these demographic factors, the study provided actionable insights that helped real estate developers, interior designers, and marketing professionals tailor their strategies more effectively. The results allowed businesses to identify which segments were most influenced by these technologies and adjust their marketing, pricing, and communication strategies accordingly. This approach not only enhanced consumer engagement but also improved the likelihood of purchase, fostering long-term customer satisfaction and loyalty.

VII. RELIABILITY AND VALIDITY

➢ *Reliability: Cronbach's Alpha Measurement*

To assess the reliability of the research instrument used in this study, Cronbach's Alpha was calculated. Cronbach's Alpha is a widely accepted measure that evaluates how well the items within a construct correlate with one another, ensuring that the scale used for measuring constructs is consistent across multiple observations.

The Cronbach's Alpha value obtained in this study is 0.9339 (93.39%), indicating excellent internal consistency. A value above 0.90 suggests that the items used in the questionnaire are highly reliable and effectively capture the intended constructs. Since the questionnaire included 36 items divided into three sections—12 questions each for AR, VR, and AI—this high alpha value reinforces that the responses provided by the participants were consistent and aligned with the study's objectives.

Given that Cronbach's Alpha is 0.9339, it suggests that the questions in the survey effectively measure the impact of AR, VR, and AI on consumer decisions in housing design, providing a high degree of confidence in the consistency and reproducibility of the results.

➢ *Validity: Ensuring Construct and Convergent Validity*

To ensure the validity of the questionnaire, this study applied construct validity and convergent validity to assess the accuracy and consistency of the measures used to capture the impact of AR, VR, and AI on consumer decisions.

- *Construct Validity*

Construct validity assesses whether the instrument truly measures the theoretical construct it aims to capture. In this study, the questionnaire was designed to assess consumer responses to AR, VR, and AI technologies in housing design. To verify construct validity, a one-way ANOVA and paired t-tests were conducted to compare responses between different demographic segments and to analyze differences in perceived usefulness and perceived ease of use for each technology.

The results of the one-way ANOVA demonstrated significant differences in the responses for VR and AI based on income and gender, reinforcing that the constructs captured in the questionnaire align with the intended variables. Additionally, the paired t-tests further supported construct validity by highlighting disparities in perceptions of ease of use and usefulness for AR and VR, while AI showed no significant disparities, indicating consistency in the responses related to AI technologies.

- *Convergent Validity*

Convergent validity ensures that multiple measures intended to assess the same construct are correlated and provide consistent results. In this study, convergent validity was evaluated through the paired t-tests that compared perceived usefulness and perceived ease of use across the three technologies.

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The paired t-tests showed significant differences between perceived usefulness and perceived ease of use for AR and VR, indicating inconsistencies in how participants perceived these technologies. However, no significant differences were observed for AI, suggesting that participants perceived AI as both easy to use and useful, reflecting higher alignment between these constructs.

➢ Statistical Justification Using One-Way ANOVA and Paired T-Tests

The use of one-way ANOVA allowed for a comparison of mean responses across different demographic categories such as age, income and gender. The results highlighted significant differences in responses for VR and AI across income groups, emphasizing the varying levels of perceived usefulness and ease of use of these technologies among different income brackets. Moreover, significant differences in AI-related perceptions based on gender further confirmed the robustness of the instrument in capturing nuanced variations.

The paired t-tests provided additional insights by analyzing the relationship between perceived usefulness and perceived ease of use for AR, VR, and AI technologies. The paired t-test results indicated:

- AR and VR: Significant disparities between perceived ease of use and perceived usefulness, indicating inconsistencies in user perceptions.
- AI: No significant disparities, suggesting that participants found AI both easy to use and useful, reflecting a higher degree of consistency in responses.

➢ *Justification for Validity and Reliability in Business and Marketing Context*

For a study focused on consumer behavior and technology adoption in housing design, ensuring high reliability and validity has significant implications:

- *Accurate Measurement of Consumer Perceptions:*

✓ High reliability and construct validity ensure that the perceptions of AR, VR, and AI technologies are accurately captured, allowing marketers to develop more targeted and personalized strategies.

- *Informed Decision-Making:*

✓ Reliable data enables real estate professionals to make informed decisions about technology integration in housing design, enhancing the customer experience and influencing purchase behavior.

- *Tailored Marketing Strategies:*

✓ By understanding how different segments perceive and adopt technologies, businesses can design tailored marketing strategies that resonate with diverse demographics, such as age, gender, and income groups.

- *Enhanced Adoption of Emerging Technologies:*

✓ Valid and reliable results provide confidence in recommending the adoption of emerging technologies, paving the way for future innovations in the real estate sector.

VIII. DATA ANALYSIS USING ONE WAY – ANOVA

Table 1 One-Way Anova for Gender

ONE – WAY ANOVA FOR GENDER						
		Sum of Squares	df	Mean Square	F	Sig.
AR_Housing_Decision_Quickly	Between Groups	1.729	1	1.729	1.642	.201
	Within Groups	323.307	307	1.053		
	Total	325.036	308			
AR_Improve_Decisions	Between Groups	1.574	1	1.574	1.366	.243
	Within Groups	353.598	307	1.152		
	Total	355.172	308			
AR_Increase_Productivity	Between Groups	.118	1	.118	.108	.743
	Within Groups	333.675	307	1.087		
	Total	333.793	308			
AR_Enhance_Comparability	Between Groups	.266	1	.266	.258	.612
	Within Groups	317.022	307	1.033		
	Total	317.288	308			
AR_Finalizing_Decisions	Between Groups	2.741	1	2.741	2.687	.102
	Within Groups	313.149	307	1.020		
	Total	315.890	308			
AR_Useful_Decisions	Between Groups	1.583	1	1.583	1.619	.204
	Within Groups	300.223	307	.978		
	Total	301.806	308			
Learing_AR_Useful_Easy	Between Groups	.358	1	.358	.202	.653

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	Within Groups	544.710	307	1.774		
	Total	545.068	308			
Easy_Visualizing_AR	Between Groups	3.004	1	3.004	1.689	.195
	Within Groups	545.889	307	1.778		
	Total	548.893	308			
Interaction_AR_Tools_Clear_Understandable	Between Groups	.886	1	.886	.515	.473
	Within Groups	527.774	307	1.719		
	Total	528.660	308			
AR_Tools_Intuitive	Between Groups	5.838	1	5.838	3.127	.078
	Within Groups	573.178	307	1.867		
	Total	579.016	308			
Easy_Skillful_AR	Between Groups	1.361	1	1.361	.741	.390
	Within Groups	563.882	307	1.837		
	Total	565.243	308			
AR_Tools_Easy_Operate	Between Groups	1.504	1	1.504	.901	.343
	Within Groups	512.638	307	1.670		
	Total	514.142	308			
VR_Experience_Layout_Effectively	Between Groups	.507	1	.507	.284	.595
	Within Groups	548.645	307	1.787		
	Total	549.152	308			
VR_Improve_Spatial_Understanding	Between Groups	3.413	1	3.413	1.927	.166
	Within Groups	543.604	307	1.771		
	Total	547.016	308			
VR_Increase_Confidence	Between Groups	1.791	1	1.791	1.016	.314
	Within Groups	541.225	307	1.763		
	Total	543.016	308			
VR_Enhance_Ability_Evaluate	Between Groups	5.301	1	5.301	2.837	.093
	Within Groups	573.715	307	1.869		
	Total	579.016	308			
VR_House_Exploration_Efficient	Between Groups	1.637	1	1.637	.876	.350
	Within Groups	573.593	307	1.868		
	Total	575.230	308			
VR_Useful_Visualizing	Between Groups	3.636	1	3.636	2.077	.151
	Within Groups	537.477	307	1.751		
	Total	541.113	308			
Learing_VR_Tools_Easy	Between Groups	4.858	1	4.858	2.368	.125
	Within Groups	629.945	307	2.052		
	Total	634.803	308			
VR_Easy_Explore	Between Groups	4.852	1	4.852	2.561	.111
	Within Groups	581.653	307	1.895		
	Total	586.505	308			
Interaction_VR_Clear_Understandable	Between Groups	1.985	1	1.985	.996	.319
	Within Groups	611.769	307	1.993		
	Total	613.754	308			
Easy_Navigate_VR_Tools	Between Groups	1.387	1	1.387	.688	.407
	Within Groups	618.813	307	2.016		
	Total	620.201	308			
Easy_Skillful_VR_Tools	Between Groups	4.373	1	4.373	2.096	.149
	Within Groups	640.424	307	2.086		
	Total	644.796	308			
VR_Tools_Easy_Operate	Between Groups	6.763	1	6.763	3.264	.072
	Within Groups	636.175	307	2.072		
	Total	642.939	308			
AI_Tools_Better_Decisions	Between Groups	8.686	1	8.686	4.782	**.030**

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	Within Groups	557.664	307	1.816		
	Total	566.350	308			
AI_Improve_Precision	Between Groups	7.681	1	7.681	4.297	**.039**
	Within Groups	548.824	307	1.788		
	Total	556.505	308			
AI_Analyze_Efficient	Between Groups	7.675	1	7.675	4.385	**.037**
	Within Groups	537.335	307	1.750		
	Total	545.010	308			
AI_Enhance_Ability_Personalize	Between Groups	2.675	1	2.675	1.464	.227
	Within Groups	561.137	307	1.828		
	Total	563.812	308			
AI_Right_Decision_Easier	Between Groups	4.858	1	4.858	2.664	.104
	Within Groups	559.945	307	1.824		
	Total	564.803	308			
AI_Useful_Decision	Between Groups	.807	1	.807	.417	.519
	Within Groups	593.937	307	1.935		
	Total	594.744	308			
Learning_AI_Tools_Easy	Between Groups	5.915	1	5.915	3.604	**.059**
	Within Groups	503.898	307	1.641		
	Total	509.812	308			
AI_Tools_Generating_Easy	Between Groups	3.247	1	3.247	1.567	.212
	Within Groups	636.390	307	2.073		
	Total	639.638	308			
Interaction_AI_Clear_Understandable	Between Groups	1.529	1	1.529	.774	.380
	Within Groups	606.711	307	1.976		
	Total	608.239	308			
AI_Relevant_Clear_Suggestions	Between Groups	6.205	1	6.205	3.569	.060
	Within Groups	533.698	307	1.738		
	Total	539.903	308			
Easy_Skillful_AI	Between Groups	6.462	1	6.462	3.432	.065
	Within Groups	578.088	307	1.883		
	Total	584.550	308			
AI_Easy_Operate	Between Groups	7.394	1	7.394	3.733	**.054**
	Within Groups	608.166	307	1.981		
	Total	615.560	308			

Table 2 One-Way Anova for Age

ONE – WAY ANOVA FOR AGE						
		Sum of Squares	df	Mean Square	F	Sig.
AR_Housing_Decision_Quickly	Between Groups	1.141	3	.380	.358	.783
	Within Groups	323.894	305	1.062		
	Total	325.036	308			
AR_Improve_Decisions	Between Groups	4.380	3	1.460	1.270	.285
	Within Groups	350.791	305	1.150		
	Total	355.172	308			
AR_Increase_Productivity	Between Groups	2.766	3	.922	.849	.468
	Within Groups	331.027	305	1.085		
	Total	333.793	308			
AR_Enhance_Comparability	Between Groups	5.137	3	1.712	1.673	.173
	Within Groups	312.151	305	1.023		
	Total	317.288	308			
AR_Finalizing_Decisions	Between Groups	2.700	3	.900	.877	.454
	Within Groups	313.190	305	1.027		
	Total	315.890	308			

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AR_Useful_Decisions	Between Groups	1.307	3	.436	.442	.723
	Within Groups	300.499	305	.985		
	Total	301.806	308			
Learing_AR_Useful_Easy	Between Groups	.905	3	.302	.169	.917
	Within Groups	544.163	305	1.784		
	Total	545.068	308			
Easy_Visualizing_AR	Between Groups	6.717	3	2.239	1.260	.288
	Within Groups	542.176	305	1.778		
	Total	548.893	308			
Interaction_AR_Tools_Clear_Understandable	Between Groups	4.167	3	1.389	.808	.490
	Within Groups	524.493	305	1.720		
	Total	528.660	308			
AR_Tools_Intuitive	Between Groups	.937	3	.312	.165	.920
	Within Groups	578.079	305	1.895		
	Total	579.016	308			
Easy_Skillful_AR	Between Groups	3.980	3	1.327	.721	.540
	Within Groups	561.263	305	1.840		
	Total	565.243	308			
AR_Tools_Easy_Operate	Between Groups	2.720	3	.907	.541	.655
	Within Groups	511.422	305	1.677		
	Total	514.142	308			
VR_Experience_Layout_Effectively	Between Groups	.953	3	.318	.177	.912
	Within Groups	548.199	305	1.797		
	Total	549.152	308			
VR_Improve_Spatial_Understanding	Between Groups	6.519	3	2.173	1.226	.300
	Within Groups	540.497	305	1.772		
	Total	547.016	308			
VR_Increase_Confidence	Between Groups	4.563	3	1.521	.862	.461
	Within Groups	538.453	305	1.765		
	Total	543.016	308			
VR_Enhance_Ability_Evaluate	Between Groups	.745	3	.248	.131	.942
	Within Groups	578.271	305	1.896		
	Total	579.016	308			
VR_House_Exploration_Efficient	Between Groups	5.300	3	1.767	.946	.419
	Within Groups	569.929	305	1.869		
	Total	575.230	308			
VR_Useful_Visualizing	Between Groups	3.390	3	1.130	.641	.589
	Within Groups	537.723	305	1.763		
	Total	541.113	308			
Learing_VR_Tools_Easy	Between Groups	.643	3	.214	.103	.958
	Within Groups	634.160	305	2.079		
	Total	634.803	308			
VR_Easy_Explore	Between Groups	1.719	3	.573	.299	.826
	Within Groups	584.786	305	1.917		
	Total	586.505	308			
Interaction_VR_Clear_Understandable	Between Groups	1.502	3	.501	.249	.862
	Within Groups	612.252	305	2.007		
	Total	613.754	308			
Easy_Navigate_VR_Tools	Between Groups	.489	3	.163	.080	.971
	Within Groups	619.712	305	2.032		
	Total	620.201	308			
Easy_Skillful_VR_Tools	Between Groups	3.136	3	1.045	.497	.685
	Within Groups	641.660	305	2.104		
	Total	644.796	308			

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VR_Tools_Easy_Operate	Between Groups	2.907	3	.969	.462	.709
	Within Groups	640.031	305	2.098		
	Total	642.939	308			
AI_Tools_Better_Decisions	Between Groups	.546	3	.182	.098	.961
	Within Groups	565.804	305	1.855		
	Total	566.350	308			
AI_Improve_Precision	Between Groups	.556	3	.185	.102	.959
	Within Groups	555.949	305	1.823		
	Total	556.505	308			
AI_Analyze_Efficient	Between Groups	.274	3	.091	.051	.985
	Within Groups	544.735	305	1.786		
	Total	545.010	308			
AI_Enhance_Ability_Personalize	Between Groups	1.114	3	.371	.201	.895
	Within Groups	562.698	305	1.845		
	Total	563.812	308			
AI_Right_Decision_Easier	Between Groups	.679	3	.226	.122	.947
	Within Groups	564.123	305	1.850		
	Total	564.803	308			
AI_Useful_Decision	Between Groups	.649	3	.216	.111	.954
	Within Groups	594.095	305	1.948		
	Total	594.744	308			
Learning_AI_Tools_Easy	Between Groups	2.236	3	.745	.448	.719
	Within Groups	507.576	305	1.664		
	Total	509.812	308			
AI_Tools_Generating_Easy	Between Groups	4.425	3	1.475	.708	.548
	Within Groups	635.212	305	2.083		
	Total	639.638	308			
Interaction_AI_Clear_Understandable	Between Groups	.877	3	.292	.147	.932
	Within Groups	607.362	305	1.991		
	Total	608.239	308			
AI_Relevant_Clear_Suggestions	Between Groups	.194	3	.065	.036	.991
	Within Groups	539.709	305	1.770		
	Total	539.903	308			
Easy_Skillful_AI	Between Groups	.106	3	.035	.019	.997
	Within Groups	584.444	305	1.916		
	Total	584.550	308			
AI_Easy_Operate	Between Groups	.870	3	.290	.144	.934
	Within Groups	614.690	305	2.015		
	Total	615.560	308			

Table 3 One-Way Anova for Income

ONE – WAY ANOVA FOR INCOME						
		Sum of Squares	df	Mean Square	F	Sig.
AR_Housing_Decision_Quickly	Between Groups	5.542	3	1.847	1.764	.154
	Within Groups	319.493	305	1.048		
	Total	325.036	308			
AR_Improve_Decisions	Between Groups	1.723	3	.574	.496	.686
	Within Groups	353.448	305	1.159		
	Total	355.172	308			
AR_Increase_Productivity	Between Groups	1.871	3	.624	.573	.633
	Within Groups	331.922	305	1.088		
	Total	333.793	308			
AR_Enhance_Comparability	Between Groups	4.831	3	1.610	1.572	.196
	Within Groups	312.457	305	1.024		

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	Total	317.288	308			
AR_Finalizing_Decisions	Between Groups	2.808	3	.936	.912	.436
	Within Groups	313.082	305	1.026		
	Total	315.890	308			
AR_Useful_Decisions	Between Groups	2.344	3	.781	.796	.497
	Within Groups	299.462	305	.982		
	Total	301.806	308			
Learing_AR_Useful_Easy	Between Groups	6.510	3	2.170	1.229	.299
	Within Groups	538.558	305	1.766		
	Total	545.068	308			
Easy_Visualizing_AR	Between Groups	7.607	3	2.536	1.429	.234
	Within Groups	541.287	305	1.775		
	Total	548.893	308			
Interaction_AR_Tools_Clear_Understandable	Between Groups	3.147	3	1.049	.609	.610
	Within Groups	525.513	305	1.723		
	Total	528.660	308			
AR_Tools_Intuitive	Between Groups	2.994	3	.998	.528	.663
	Within Groups	576.022	305	1.889		
	Total	579.016	308			
Easy_Skillful_AR	Between Groups	4.273	3	1.424	.774	.509
	Within Groups	560.969	305	1.839		
	Total	565.243	308			
AR_Tools_Easy_Operate	Between Groups	1.396	3	.465	.277	.842
	Within Groups	512.746	305	1.681		
	Total	514.142	308			
VR_Experience_Layout_Effectively	Between Groups	6.965	3	2.322	1.306	.272
	Within Groups	542.187	305	1.778		
	Total	549.152	308			
VR_Improve_Spatial_Understanding	Between Groups	6.664	3	2.221	1.254	.290
	Within Groups	540.352	305	1.772		
	Total	547.016	308			
VR_Increase_Confidence	Between Groups	3.564	3	1.188	.672	.570
	Within Groups	539.453	305	1.769		
	Total	543.016	308			
VR_Enhance_Ability_Evaluate	Between Groups	3.402	3	1.134	.601	.615
	Within Groups	575.615	305	1.887		
	Total	579.016	308			
VR_House_Exploration_Efficient	Between Groups	4.840	3	1.613	.863	.461
	Within Groups	570.390	305	1.870		
	Total	575.230	308			
VR_Useful_Visualizing	Between Groups	1.621	3	.540	.305	.821
	Within Groups	539.492	305	1.769		
	Total	541.113	308			
Learing_VR_Tools_Easy	Between Groups	18.756	3	6.252	3.095	**.027**
	Within Groups	616.046	305	2.020		
	Total	634.803	308			
VR_Easy_Explore	Between Groups	18.314	3	6.105	3.277	**.021**
	Within Groups	568.191	305	1.863		
	Total	586.505	308			
Interaction_VR_Clear_Understandable	Between Groups	12.044	3	4.015	2.035	.109
	Within Groups	601.710	305	1.973		
	Total	613.754	308			
Easy_Navigate_VR_Tools	Between Groups	17.459	3	5.820	2.945	**.033**
	Within Groups	602.742	305	1.976		

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	Total	620.201	308			
Easy_Skillful_VR_Tools	Between Groups	8.501	3	2.834	1.358	.256
	Within Groups	636.295	305	2.086		
	Total	644.796	308			
VR_Tools_Easy_Operate	Between Groups	23.434	3	7.811	3.846	**.010**
	Within Groups	619.505	305	2.031		
	Total	642.939	308			
AI_Tools_Better_Decisions	Between Groups	10.745	3	3.582	1.966	.119
	Within Groups	555.605	305	1.822		
	Total	566.350	308			
AI_Improve_Precision	Between Groups	8.380	3	2.793	1.554	.201
	Within Groups	548.125	305	1.797		
	Total	556.505	308			
AI_Analyze_Efficient	Between Groups	22.609	3	7.536	4.400	**.005**
	Within Groups	522.400	305	1.713		
	Total	545.010	308			
AI_Enhance_Ability_Personalize	Between Groups	9.770	3	3.257	1.793	.149
	Within Groups	554.042	305	1.817		
	Total	563.812	308			
AI_Right_Decision_Easier	Between Groups	11.031	3	3.677	2.025	.110
	Within Groups	553.771	305	1.816		
	Total	564.803	308			
AI_Useful_Decision	Between Groups	19.563	3	6.521	3.458	**.017**
	Within Groups	575.181	305	1.886		
	Total	594.744	308			
Learning_AI_Tools_Easy	Between Groups	13.842	3	4.614	2.837	**.038**
	Within Groups	495.970	305	1.626		
	Total	509.812	308			
AI_Tools_Generating_Easy	Between Groups	9.082	3	3.027	1.464	.224
	Within Groups	630.555	305	2.067		
	Total	639.638	308			
Interaction_AI_Clear_Understandable	Between Groups	16.508	3	5.503	2.836	**.038**
	Within Groups	591.731	305	1.940		
	Total	608.239	308			
AI_Relevant_Clear_Suggestions	Between Groups	17.124	3	5.708	3.330	**.020**
	Within Groups	522.779	305	1.714		
	Total	539.903	308			
Easy_Skillful_AI	Between Groups	12.560	3	4.187	2.232	.084
	Within Groups	571.990	305	1.875		
	Total	584.550	308			
AI_Easy_Operate	Between Groups	15.726	3	5.242	2.665	**.048**
	Within Groups	599.834	305	1.967		
	Total	615.560	308			

This section presents an in-depth analysis of how Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI) influence consumer purchase decisions in housing design, based on one-way ANOVA results. The results indicate that gender and age do not significantly impact the perception of AR, VR, and AI tools, but income plays a critical role, particularly in AI and VR adoption. While AR appears to be uniformly accepted across different demographics, VR and AI demonstrate variations in usability, efficiency, and ease of learning based on income levels. Additionally, AI-based decision-making tools exhibit significant differences based on gender, indicating potential cognitive and behavioral factors influencing how different groups interact with AI-driven housing solutions.

The following analysis is structured into three sections—AR, VR, and AI—each presenting the statistical data first, followed by an extended theoretical discussion that explores underlying patterns, cognitive influences, and market trends shaping consumer responses to these technologies.

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➢ *Augmented Reality (AR) And Consumer Decision-Making*

The ANOVA results for AR indicate no statistically significant differences across gender, age, or income groups. The p-values remain above 0.05, meaning that consumer perceptions of AR in housing design do not vary significantly based on demographic factors. However, some noteworthy F-values suggest potential variations, albeit not statistically significant:

- I would find AR tools intuitive to customize housing designs: (F = 3.127, p = 0.078) (highest in gender comparison)
- Using AR would enhance my ability to compare design options: (F = 1.673, p = 0.173) (highest in age comparison)
- I would find AR useful for housing design decisions: (F = 0.796, p = 0.497) (highest in income comparison)

These results indicate that AR is perceived similarly across different consumer groups, implying a universal level of usability and effectiveness regardless of gender, age, or income.

Augmented Reality (AR) has transformed the way consumers interact with housing designs by overlaying digital elements onto real-world spaces. Unlike Virtual Reality (VR), which immerses users in a fully virtual environment, AR allows users to see and manipulate design elements within their actual living space. This ability to visualize furniture placement, color schemes, and spatial adjustments in real time makes AR a valuable tool for both prospective homebuyers and interior designers.

One of the key reasons AR does not show demographic-based significance is its low adoption barrier. Unlike VR, which requires dedicated headsets and immersive environments, AR is accessible through common digital devices, making it universally available regardless of financial status or technological expertise. Consumers can effortlessly integrate AR into their decision-making process, allowing them to experiment with different housing aesthetics without requiring advanced technical knowledge.

From a cognitive perspective, AR enhances perceptual fluency, meaning that users find it easier to process and understand the visual information it provides. Studies on decision-making suggest that when consumers are presented with highly visual and interactive tools, they develop stronger cognitive connections with the products they explore. In the context of housing design, this ability to "try before you buy" reduces cognitive load, minimizes decision fatigue, and enhances purchase confidence.

Additionally, AR fosters emotional engagement by enabling users to personalize their experience. Research in consumer psychology indicates that when individuals can visualize a product within their personal space, their emotional attachment to it increases, leading to higher purchase intent. However, since this phenomenon applies across all demographic groups, AR does not exhibit statistically significant differences across gender, age, or income.

➢ *Virtual Reality (VR) And Consumer Decision-Making*

Unlike AR, VR-related variables show statistically significant differences based on income. Gender and age do not significantly affect VR adoption, but income plays a major role in shaping how consumers perceive and interact with VR-based housing design tools. The following VR variables yielded statistically significant results based on income:

- Learning to use VR tools for housing design would be easy for me: (p = 0.027)
- I would find VR easy to use for exploring housing designs: (p = 0.021)
- It would be easy to navigate housing designs using VR tools: (p = 0.033)
- I would find VR tools easy to operate for housing design decisions: (p = 0.010)

These results suggest that higher-income consumers find VR tools easier to learn, navigate, and operate, likely due to greater exposure to high-end digital interfaces and immersive technologies.

Virtual Reality (VR) introduces a level of immersion that goes beyond traditional visualization techniques, allowing consumers to experience a housing design as if they were physically present in the space. This enhanced spatial understanding helps potential buyers evaluate layouts, compare different architectural styles, and make informed purchase decisions.

The significant income-based differences in VR adoption stem from the cost and complexity of VR technology. Unlike AR, which can be accessed through smartphones and tablets, VR requires dedicated hardware such as headsets, motion sensors, and high-performance computing systems. These technological requirements create a financial barrier that makes VR more accessible to affluent consumers who are willing to invest in immersive property exploration.

Another contributing factor is technological familiarity. Consumers from higher-income groups may have greater exposure to VR through professional training, gaming, or other digital applications, making them more adept at navigating and utilizing VR tools for housing design. In contrast, consumers from lower-income backgrounds may lack prior experience with VR, resulting in a steeper learning curve and lower adoption rates.

From a psychological standpoint, VR enhances cognitive presence, which refers to the sense of "being there" in a virtual space. This heightened sense of realism can lead to greater emotional engagement and increased trust in the product being showcased. However, because VR requires a higher degree of digital literacy and financial investment, its adoption remains uneven across different income levels.

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➢ *Artificial Intelligence (AI) and Consumer Decision-Making*

AI demonstrates the most significant variations based on both gender and income, highlighting its role as a highly adaptive yet cognitively demanding technology. The ANOVA results show multiple AI-related variables with p-values below 0.05, indicating significant differences:

- *Gender-Based AI Significance*

✓ Using AI would help me make better housing design decisions: (p = 0.030)
✓ AI would improve the precision of my housing design preferences: (p = 0.039)
✓ Using AI would make analyzing housing design trends more efficient: (p = 0.037)
✓ Learning to use AI tools for housing design would be easy for me: (p = 0.059)
✓ I would find AI tools easy to operate for housing design decisions: (p = 0.054)

- *Income-Based AI Significance*

✓ Using AI would make analyzing housing design trends more efficient: (p = 0.005)
✓ AI would make choosing the right design options easier for me: (p = 0.017)
✓ Learning to use AI tools for housing design would be easy for me: (p = 0.038)
✓ My interaction with AI tools would be clear and understandable: (p = 0.038)
✓ AI tools would provide clear and relevant suggestions for my housing design needs: (p = 0.020)
✓ I would find AI tools easy to operate for housing design decisions: (p = 0.048)

Artificial Intelligence (AI) plays a pivotal role in modern housing design, offering predictive analytics, automated customization, and data-driven recommendations. AI can process vast amounts of consumer data to suggest optimal home layouts, material choices, and interior aesthetics, making it a valuable tool for decision-making.

The gender-based significance in AI adoption suggests that different cognitive approaches influence how consumers interact with AI-driven tools. Previous studies in human-computer interaction suggest that some consumers may prioritize AI's analytical precision, while others may focus on its ease of use and transparency.

Income-based variations in AI adoption highlight the role of digital exposure and financial investment in shaping AI engagement. Higher-income consumers, who often interact with AI in finance, healthcare, and other industries, may find AI-driven housing recommendations more intuitive and reliable, whereas lower-income consumers may perceive AI as complex or unnecessary.

IX. DATA ANALYSIS USING PAIRED T - TEST

Table 4 Paired Sample Test

Paired Samples Test										
		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				One-Sided p	Two-Sided p
					Lower	Upper				
Pair 1	PU_AR - PEOU_AR	-2.589	8.929	.508	-3.588	-1.590	-5.097	308	**<.001**	**<.001**
Pair 2	PU_AI - PEOU_AI	.078	2.477	.141	-.200	.355	.551	308	.291	.582
Pair 3	PU_VR - PEOU_VR	4.599	10.896	.620	3.379	5.818	7.419	308	**<.001**	**<.001**

In the context of house design, three new technologies—augmented reality (AR), virtual reality (VR), and artificial intelligence (AI)—were compared on perceived usefulness (PU) and perceived ease of use (PEU) using a paired t-test. Finding out if respondents thought these technologies were both helpful and simple to use, or if there were notable differences between the two, was the aim of this investigation.

➢ *AR or Augmented Reality*

The statistical analysis showed that PU and PEU for AR differed significantly, and the one-sided ($p < 0.01$) and two-sided ($p < 0.01$) tests supported this finding. This implies that although consumers could find AR tools useful for designing homes, they also think they are hard to utilise. The notable disparity between PU and PEU suggests that usability obstacles, including intricate user interfaces, a challenging learning curve, or technological constraints, could be preventing AR technology from being smoothly implemented in this field.

➢ *VR or Virtual Reality*

As with AR, the results indicated a statistically significant difference between PU and PEU for VR, and this conclusion was supported by both one-sided ($p < 0.01$) and two-sided ($p < 0.01$) values. This suggests that although respondents are aware of the potential benefits of virtual reality (VR) in house design, like improved spatial awareness and immersive visualisation, they also found the technology to be somewhat challenging to use. Possible usability issues might be caused by complicated navigation, technology specifications, or human discomfort from prolonged VR use. These findings demonstrate the necessity of more user-friendly design improvements and intuitive VR interfaces to increase accessibility.

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➢ *AI or Artificial Intelligence*

With one-sided (p = 0.291) and two-sided (p = 0.582) values significantly over the conventional significance level, the results for AI showed no statistically significant difference between PU and PEU, in contrast to AR and VR. This implies that respondents believe AI-based solutions are practical and user-friendly in the context of home design. AI apps may mostly operate in the background, automating procedures, making wise recommendations, and optimising designs, which lessens usability issues in contrast to AR and VR, which need direct user involvement with virtual surroundings. AI's incorporation into house design may be smoother and need less technical know-how from end users, according to the balance between PU and PEU.

The results point to a significant usability gap in AR and VR technologies for house design, where perceived utility and usability are not the same. This emphasises that to increase adoption, better user experience, training, and interface simplifications are required. Conversely, AI seems to provide both high usability and useful advantages, which makes it a more approachable and well recognised technology in the industry. Future development plans that emphasise improving AR and VR's usability while utilising AI's advantages for a smooth incorporation into housing design workflows can be informed by these observations.

X. RESULTS AND DISCUSSIONS

➢ *One - Way Anova Summary*

A one-way ANOVA was conducted to evaluate the impact of income and gender on the perceived usefulness and ease of use of AR, VR, and AI technologies. The results indicated that:

- *AI Outperformed AR and VR:*

AI showed significant results for both gender and income, establishing itself as the most superior technology in influencing consumer purchase decisions.

Significant differences were observed for:

✓ Using AI would make analyzing housing design trends more efficient: p = 0.037 (gender) and p = 0.005 (income).
✓ Using AI would help me make better housing design decisions: p = 0.030 (gender).
✓ AI would improve the precision of my housing design preferences: p = 0.039 (gender) and p = 0.201 (income, marginally significant).
✓ I would find AI useful for making housing design decisions: p = 0.017 (income).
✓ Learning to use AI tools for housing design would be easy for me: p = 0.059 (gender) and p = 0.038 (income).
✓ AI tools would provide clear and relevant suggestions for my housing design needs: p = 0.020 (income).

- *VR Showed Significant Results Only by Income:*

Significant results were observed in ease-of-use variables across income levels for VR:

✓ Learning to use VR tools for housing design would be easy for me: p = 0.027
✓ I would find VR easy to use for exploring housing designs: p = 0.021
✓ It would be easy to navigate housing designs using VR tools: p = 0.033
✓ I would find VR tools easy to operate for housing design decisions: p = 0.010

- *AR Failed to Show Significance:*

AR did not yield significant results in any category (gender or income), indicating that AR was the least impactful among the three technologies for influencing purchase decisions in housing design.

➢ *Paired T-Test Results Summary*

To compare the Perceived Usefulness (PU) and Perceived Ease of Use (PEU) of AR, VR, and AI, a paired t-test was conducted.

- *AR and VR Showed Significant Disparity:*

✓ AR: Significant disparity between PU and PEU ($p < 0.01$), suggesting that while users found AR useful, they struggled with its ease of use.
✓ VR: Significant disparity between PU and PEU ($p < 0.01$), indicating that despite VR's high usefulness, users experienced challenges navigating VR environments.

- *AI Had No Significant Disparity:*

✓ AI: No significant difference between PU and PEU (p = 0.291, 0.582), indicating that users perceived AI as equally useful and easy to use, reinforcing its superiority.

➢ *Significance Across Gender and Income*

- *Gender-Based AI Results:*

AI showed significant results across gender for:

✓ Using AI would make analyzing housing design trends more efficient: p = 0.037
✓ Using AI would help me make better housing design decisions: p = 0.030
✓ AI would improve the precision of my housing design preferences: p = 0.039
✓ I would find AI tools easy to operate for housing design decisions: p = 0.054 (marginal significance)
✓ Learning to use AI tools for housing design would be easy for me: p = 0.059 (marginal significance)

- *Income-Based VR and AI Results:*

VR and AI yielded significant results across income groups:

✓ VR: Ease of use variables showed significant differences across income groups.
✓ AI: Significant results for decision-making, learning, and interaction variables across income levels.

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➢ *Discussion*

- *AI's Superior Impact on Purchase Decisions*

AI emerged as the most impactful technology in influencing purchase decisions, with significant results across gender and income. AI's ability to provide personalized recommendations (Zimmermann et al., 2022) and analyze large datasets to generate precise suggestions (Miljkovic et al., 2023) resonates strongly with Indian consumers, who often seek personalized experiences in high-involvement decisions like housing design.

✓ AI's ability to enhance decision-making through precision and efficiency aligns with findings by Saeed et al. (2024), who demonstrated that AI improves the accuracy of design choices in the furniture and home décor industry.
✓ Furthermore, AI's ease of use reduces the learning curve, a critical factor for consumers with varying levels of technological proficiency. This echoes the findings of Nalbant and Aydin (2023), who highlighted AI's transformative potential in enhancing customer engagement and improving marketing strategies.

- *VR: High Usefulness but Difficulty in Navigation*

VR yielded significant results for income but failed to show significance in paired t-tests, indicating a mismatch between its perceived usefulness and ease of use.

✓ VR's high usefulness aligns with the work of Azmi et al. (2021), who demonstrated that VR enhances spatial understanding and boosts consumer confidence by allowing immersive virtual walkthroughs. However, the difficulty in navigating VR environments may explain the disparity observed in paired t-tests.
✓ Indian consumers, particularly those in middle-income groups, may face challenges with the technical complexity of VR hardware and interfaces. This is consistent with findings by Deep et al. (2023), who emphasized the challenges of VR adoption in the Indian AEC (Architecture, Engineering, and Construction) sector due to the steep learning curve.

- *AR: Failure to Make a Significant Impact*

AR did not yield significant results in ANOVA, t-tests, or demographic comparisons, suggesting that AR was least impactful in influencing purchase decisions.

✓ Although AR is known for enhancing visualization in housing design (Rauschnabel et al., 2022), the lack of significant impact may be due to usability issues and a lack of widespread familiarity among Indian consumers.
✓ Ibrahim et al. (2023) suggested that while AR enhances visualization, it may not be as intuitive or engaging for complex decision-making processes. This finding highlights the gap in AR adoption, especially in emerging markets like India, where technological literacy varies across consumer segments.

- *Income-Based Insights: VR's Higher Impact on Higher-Income Groups*

VR showed significant results across income groups for ease of use, suggesting that higher-income groups found VR tools easier to navigate compared to middle-income groups.

✓ Higher-income consumers may have more exposure to advanced technologies, enabling them to navigate VR interfaces more effectively. This is consistent with findings by Wonsik and Sejin (2023), who noted that higher-income consumers are more receptive to VR adoption in e-commerce and real estate.

- *Gender-Based Insights: AI's Consistency Across Genders*

AI's consistent performance across gender highlights its broad appeal in the Indian market.

✓ Seagraves (2023) demonstrated that AI's ability to generate personalized recommendations resonates with both male and female consumers, particularly in high-involvement decisions like home design.
✓ AI's intuitive and accessible interface makes it easier for consumers across diverse demographics to engage with the technology effectively, contributing to its superior results.

- *Indian Context and Implications*

India's diverse demographic profile and growing reliance on digital technologies in real estate make the findings particularly relevant to the Indian housing design sector.

✓ The increasing digital transformation in Indian real estate has created opportunities for AI, VR, and AR to enhance consumer experiences (Deep et al., 2023).
✓ AI's superior performance reflects Indian consumers' preference for personalized, data-driven recommendations that reduce uncertainty in high-stake purchases.
✓ VR's challenges in ease of use highlight the need for more intuitive interfaces and simplified hardware for Indian consumers.
✓ AR's limited impact underscores the need for greater awareness and training to help Indian consumers leverage AR effectively in housing design.

➢ *Evaluation of Hypothesis*

- *Hypothesis One: Impact of AR on Consumer Purchase Decisions*

✓ H0: Consumer purchase decisions are not significantly impacted by AR in the housing (aesthetics) industry.
✓ H1: Consumer purchase decisions are significantly impacted by AR in the housing (aesthetics) industry.

The results fail to reject the null hypothesis (H0), indicating that AR does not significantly impact consumer purchase decisions in the housing aesthetics industry. AR's failure to significantly influence purchase decisions may be attributed to usability challenges and a lack of familiarity with AR tools among Indian consumers. According to Ibrahim et

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al. (2023), AR enhances visualization but may not provide sufficient engagement to influence high-stake decisions like housing purchases. Additionally, Rauschnabel et al. (2022) highlighted that while AR improves product visualization, its complexity often deters users from adopting the technology, especially in emerging markets like India where technological literacy varies.

✓ *Conclusion:*
H0 is accepted, and AR was found to have no significant impact on consumer purchase decisions. Improving the usability and awareness of AR tools may enhance their future adoption in India's housing design industry.

- *Hypothesis Two: Impact of VR on Consumer Purchase Decisions*

✓ H0: Consumer purchase decisions are not significantly impacted by VR in the housing (aesthetics) industry.
✓ H1: Consumer purchase decisions are significantly impacted by VR in the housing (aesthetics) industry.

The results partially support H1, as VR showed significance across income groups in ANOVA but failed to demonstrate consistent results in paired t-tests comparing usefulness and ease of use. VR's usefulness in visualizing spatial layouts and enhancing buyer confidence is well-established in literature. Azmi et al. (2021) highlighted that VR helps consumers develop a realistic sense of space, leading to more informed decisions. However, the learning curve and operational complexity associated with VR tools may reduce its perceived ease of use. In the Indian context, Deep et al. (2023) found that VR adoption in the Indian real estate sector remains limited due to challenges related to hardware accessibility and user training.

✓ *Conclusion:*
H1 is partially accepted. While VR influences consumer purchase decisions, challenges related to ease of use must be addressed to fully unlock its potential in the Indian housing design sector.

- *Hypothesis Three: Impact of AI on Consumer Purchase Decisions*

✓ H0: Consumer purchase decisions are not significantly impacted by AI in the housing (aesthetics) industry.
✓ H1: Consumer purchase decisions are significantly impacted by AI in the housing (aesthetics) industry.

The results strongly reject the null hypothesis (H0) and provide robust support for H1, indicating that AI significantly impacts consumer purchase decisions in the housing aesthetics industry. AI's ability to offer personalized and data-driven recommendations resonates strongly with Indian consumers, who seek guidance in high-involvement decisions like housing design. Saeed et al. (2024) emphasized that AI enhances decision-making efficiency by reducing uncertainty in complex purchase scenarios. In India, where digital literacy and familiarity with AI-driven platforms are rapidly increasing, Miljkovic et al. (2023) found that AI adoption is growing due to its ability to analyze large datasets and predict market trends effectively.

✓ *Conclusion:*
H1 is fully accepted. AI demonstrates significant and consistent impact on consumer purchase decisions, making it the most influential technology in the Indian housing design industry.

- *Hypothesis Four: Relationship Between AR, VR, AI Usage and Consumer Inclination to Purchase*

✓ H0: There is no positive relationship between the usage of AR, VR, and AI by housing companies and the inclination toward purchases by consumers.
✓ H1: There is a positive relationship between the usage of AR, VR, and AI by housing companies and the inclination toward purchases by consumers.

The results partially support H1, suggesting that while AI shows a positive relationship with purchase inclination, the same cannot be conclusively established for AR and VR. AI's Impact on Purchase Inclination: AI's ability to provide personalized and tailored recommendations aligns with findings by Seagraves (2023), who emphasized that AI-driven insights lead to higher consumer satisfaction and greater inclination to purchase. However, VR's limited impact, despite its usefulness, indicates that the operational complexity of VR tools may restrict its influence on purchase inclination. Similarly, AR's minimal influence suggests that its impact on high-stake decisions like home purchases remains limited without seamless usability.

✓ *Conclusion:*
H1 is partially accepted. AI shows a positive relationship with purchase inclination, while VR and AR do not demonstrate a consistent or significant relationship.

XI. FINDINGS

This study examined the influence of Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI) on consumer purchase decisions in the housing aesthetics industry, with a focus on demographic factors such as income, age, and gender.

The results indicate that both income and gender play significant roles in shaping consumers' perceptions of VR and AI technologies. VR tools were considerably simpler for higher-income groups to use ($p = 0.010$), navigate ($p = 0.033$), explore ($p = 0.021$), and learn ($p = 0.027$). In a similar way, wealthy consumers thought AI was more effective at evaluating data ($p = 0.005$), making decisions that were beneficial ($p = 0.017$), being easier to learn ($p = 0.038$), giving interactions that were clear and understood ($p = 0.038$), and making recommendations that were pertinent and clear ($p = 0.020$). These findings suggest that the usability of VR and AI is closely tied to income, with wealthier consumers better equipped to adopt these technologies in housing design. Higher-income groups value VR's usability

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and AI's data-driven insights for efficient and precise decision-making, making both technologies essential tools for this demographic.

In addition to income, gender also influenced perceptions of AI. Males and females differed in their evaluation of AI's ability to provide better decisions ($p = 0.030$), improve precision ($p = 0.039$), and analyse data efficiently ($p = 0.037$), with near-significant differences in AI's ease of operation ($p = 0.054$) and ease of learning ($p = 0.059$). These results indicate that gender has a significant impact on how people view and use AI offerings, with men and women experiencing AI's usability and decision-making abilities differently. This emphasizes the necessity of designing and marketing AI technologies that account for these gender differences, guaranteeing that the technology is user-friendly and efficient for both male and female consumers. There were no apparent variations in how these technologies were perceived by age groups, according to the ANOVA analysis ($p > 0.05$.). This suggests that these technologies are widely appealing to a wide range of age groups and that age is not a limiting factor for incorporating them into housing design decision-making processes and can be used by people of all ages in the sector.

The T-test results for perceived usefulness (PU) versus perceived ease of use (PEOU) revealed interesting insights regarding how consumers view these technologies. For AR, there was a significant difference between PU and PEOU ($p < 0.01$), suggesting that although AR is thought to be very helpful for picturing house ideas, it is difficult to use. This implies that even with its potential advantages, AR's complexity may prevent it from being widely adopted until usability improvements are achieved. Similar to this, there was a significant difference between PU and PEOU for VR ($p < 0.01$), indicating that while VR improves spatial awareness and offers immersive design experiences, users find it challenging to use and navigate. On the other hand, AI showed no significant difference between PU and PEOU ($p = 0.291$, $p = 0.582$), indicating that consumers view AI as both useful and easy to use. This balanced perception makes AI particularly appealing, as it provides clear and understandable interactions ($p = .038$) and excels in efficient data analysis ($p = 0.005$). These characteristics make AI a very useful tool for making decisions about home design, particularly for customers looking for individualized, data-driven insights.

According to the result, AI appears to have the biggest impact on consumer choices in the housing aesthetics sector, especially for higher-income groups. It is a crucial instrument in home design because of its well-balanced idea of utility and usability. However, while creating AI tools to serve both male and female customers, gender disparities should be taken into account. While AR and VR usability issues continue to be major obstacles to broader acceptance, VR adoption is mostly driven by income, with wealthier consumers finding it simpler to use. For the housing industry to see increased consumer engagement with new technologies, these problems must be resolved.

XII. CONCLUSION

This research aimed to explore how consumer choices in the housing aesthetics sector are affected by Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI). In addition, the study examined the ways in which demographic variables such as age, gender, and income affect the adoption of these technologies. This utilized statistical tools like the T-test and ANOVA and the Technology Acceptance Model (TAM) to evaluate how consumers view these technologies.

Cronbach's Alpha was the primary tool used in the study to evaluate the internal consistency and dependability of the survey instrument to evaluate various aspects of the user experience with AR, VR, and AI technologies. The replies frequently captured the targeted characteristics of consumer behaviour, perceived usefulness, and simplicity of use, as indicated by the excellent reliability demonstrated by the Cronbach's Alpha score of 93.4%.

Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) were compared for each technology using T-tests. Significant gaps were found in the results for AR and VR, suggesting that although these technologies improve geographic knowledge and visualization, their complexity restricts their usability. This demonstrates the necessity of making AR and VR tools more user-friendly in order to boost their use in home design. AI showed no significant difference between PU and PEOU, demonstrating a balanced view between usefulness and ease of use. Since AI has been incorporated into user-friendly applications, it has been viewed as both practical and simple to use which positions it for wider adoption in house design.

According to the ANOVA results, people's perceptions of AI tools were significantly influenced by their income, with higher-income groups believing AI to be more useful and approachable, especially when it came to data-driven decision-making in intricate housing designs. Another factor was gender, as men and women had different opinions about AI's capacity for accurate and efficient decision-making. Age, however, had no discernible effect on how AR, VR, or AI were seen, indicating that these technologies are widely appealing to a wide range of age groups. Because of its usefulness and ease of use, particularly for wealthy consumers, artificial intelligence (AI) has become the most potent technology affecting consumer choices overall. On the other hand, there are important usability issues with AR and VR that need to be resolved for wider adoption.

IMPLICATIONS

- *Improving usability AR and VR:*

Although AR and VR have been acknowledged for their potential to improve spatial awareness and visualization, their complex interfaces for users have prevented their adoption. Developers should focus on making these technologies more user-friendly in order to promote wider adoption. Improved functionality, streamlined user interfaces, and intuitive user

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experiences will be essential for increasing engagement and opening up these tools to a larger audience.

- *Focus on AI for decision-making:*

AI has emerged as the most influential technology in consumer purchasing decisions, particularly for wealthy customers. Its ease of use and efficiency in delivering data-driven insights position it as a key tool in housing design. Developers should invest in further integrating AI capabilities, like customized suggestions and data analysis, to enhance the decision-making process and meet customer expectations.

- *Addressing Gender Differences in AI Adoption:*

Developers should create AI tools that are appropriate for both male and female users, as gender influences how AI is viewed in terms of efficiency, accuracy, and decision-making. By catering to the various demands of various user groups, making sure interfaces are easy to use and intuitive helps increase adoption and satisfaction overall.

- *Focusing on consumers with higher income:*

The study found that perceptions and acceptance of AI technologies are significantly influenced by income. Given that consumers with higher incomes are more inclined to value AI's efficiency and usability, marketing campaigns should target this group. Enhancing market penetration and customer happiness may be possible by tailoring AI solutions to the more intricate design requirements of affluent consumers.

- *Training and Consumer Education:*

Companies should invest in consumer education programs, such as tutorials and workshops, to address AR and VR's usability challenges. These efforts will reduce the learning curve and increase adoption, especially among less tech-savvy users.

RECOMMENDATIONS

While this study provides valuable insights into how AR, VR, and AI influence consumer purchase decisions in housing design, certain limitations must be acknowledged. Firstly, the research primarily focuses on the Ahmedabad housing market in Gujarat, meaning the findings may not be fully applicable to other regions. Different cultural attitudes toward technology adoption, economic conditions, and real estate market structures across India and globally could influence consumer behavior in ways not captured in this study.

Virtual Reality (VR), though effective in enhancing spatial visualization, remains inaccessible to many due to its high cost and technological requirements. To address this, companies should focus on developing affordable VR solutions that can be accessed through mobile applications rather than expensive headsets. Additionally, real estate firms should invest in user-friendly VR interfaces that reduce the complexity of operation, making the technology more inclusive for individuals who may not be technologically proficient.

Augmented Reality (AR), while widely accepted, does not significantly influence purchase decisions, possibly due to usability challenges. Simplifying AR interfaces and ensuring seamless integration with existing real estate platforms could improve its effectiveness. For instance, mobile-based AR applications that allow consumers to visualize furniture placement and interior design modifications should be made more intuitive, with guided tutorials and easy navigation features.

Moreover, the study indicates that AI and VR adoption vary across income groups, highlighting a digital divide in accessibility. To bridge this gap, real estate developers could introduce initiatives such as free training programs or interactive demonstration centers where potential buyers can experience AR and VR technologies firsthand. Additionally, AI- driven virtual assistants could be implemented to guide users through housing decisions, making technology-driven choices more accessible to all consumers.

As AI-driven decision-making becomes more prevalent, it is also crucial to address concerns related to data privacy. Consumers may be hesitant to rely on AI-powered recommendations if they are unsure about how their data is being used. Therefore, real estate companies must implement transparent data policies, secure AI algorithms, and clear consent mechanisms to build consumer trust and encourage broader adoption of these technologies.

LIMITATIONS

While this study provides valuable insights into how AR, VR, and AI influence consumer purchase decisions in housing design, certain limitations must be acknowledged. Firstly, the research primarily focuses on the Indian housing market, meaning the findings may not be fully applicable to other regions. Different cultural attitudes toward technology adoption, economic conditions, and real estate market structures could influence consumer behavior in ways not captured in this study.

Another limitation is the potential influence of external economic factors. Market fluctuations, interest rates, and real estate regulations play a crucial role in consumer decision-making but were not considered in this research. Future studies could incorporate these factors to gain a more comprehensive understanding of how technological tools interact with broader economic conditions.

The study also relies on self-reported data collected through surveys, which may be subject to response bias. Participants may have provided answers based on perceived expectations rather than actual behavior. Incorporating behavioral tracking methods or experimental studies could help validate these findings by capturing real-time interactions with AR, VR, and AI in housing design.

Additionally, this research examines immediate consumer responses but does not account for long-term behavioral shifts. While AI may seem useful in the short term, it remains unclear whether AI-driven housing decisions lead to higher satisfaction post- purchase. A longitudinal study tracking consumer experiences before and after

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purchasing a home using AI recommendations would offer deeper insights.

Another important limitation is the variation in digital literacy levels among consumers. While AI was found to have a strong influence, its effectiveness depends on how familiar consumers are with AI-driven decision-making tools. Those with prior exposure to AI in fields such as finance or e-commerce may find AI-based real estate solutions easier to use, while others may struggle with adoption due to lack of experience.

FUTURE SCOPE

Given these limitations, there are several opportunities for future research. One promising area is a longitudinal study on AI's impact, which could explore whether AI-driven recommendations lead to long-term consumer satisfaction and trust in housing decisions. Understanding how AI influences post-purchase experiences can help developers refine their algorithms and provide better decision-making tools.

Another potential area of study is a cross-market comparative analysis that examines AR, VR, and AI adoption in different economic and cultural contexts. Comparing how these technologies are perceived in developed versus developing markets could offer insights into global applicability and reveal strategies to enhance consumer engagement across diverse regions.

As smart home technology continues to evolve, there is also an opportunity to study how AI, AR, and VR integrate with IoT (Internet of Things) devices in modern housing. For instance, AI-powered smart home assistants that adapt to consumer preferences could further enhance decision-making, creating a more seamless and personalized home- buying experience.

Additionally, since VR adoption is influenced by income levels, future research could focus on making VR more accessible to lower-income consumers. Exploring cost-effective alternatives, such as VR applications that do not require expensive hardware, could help increase adoption rates.

Another area worth investigating is the emotional and psychological aspects of AI in real estate decision-making. AI's ability to analyze vast amounts of data can certainly assist consumers, but its impact on emotions, trust, and perceived risks in home-buying decisions remains underexplored. Future studies could analyze how different consumer groups react emotionally to AI-generated recommendations and whether these reactions influence final purchase decisions.

Overall, this research highlights the transformative role of AR, VR, and AI in housing design decisions. However, further studies are needed to refine these technologies, address accessibility challenges, and explore their long-term implications on consumer behavior.

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REFERENCES

[1] Azmi, A., Ibrahim, R., Abdul Ghafar, M., & Rashidi, A. (2021). Smarter real estate marketing using virtual reality to influence potential homebuyers' emotions and purchase intention. Smart and Sustainable Built Environment. https://www.emerald.com/insight/content/doi/10.1108/sasbe-03-2021-0056/full/html

[2] Azuma, R. T. (1997). A Survey of Augmented Reality. Presence: Teleoperators and Virtual Environments/MIT press. http://www.originality.idv.tw/webhosting/ndu/thesis/ar/references/1997%20A%20Survey%20of%20Augmented%20Reality(Azuma).pdf

[3] Baiying, Q., & Chonlavit, S. (2024). Factors affecting virtual reality interior design products acceptance behavior of consumer from Shenzhen City, China. Journal of Electrical Systems. https://www.proquest.com/docview/3076296869?pq-origsite=gscholar&fromopenview=true&sourcetype=Scholarly%20Journals

[4] Chylinski, M., Heller, J., Hilken, T., Keeling, D. I., Mahr, D., & de Ruyter, K. (2020). Augmented reality marketing: A technology-enabled approach to situated customer experience. Australasian Marketing Journal, 28(4), 374-384. https://journals.sagepub.com/doi/abs/10.1016/j.ausmj.2020.04.004

[5] Deep, S., Vishnoi, S., Malhotra, R., Mathur, S., Yawale, H., Kumar, A., & Singla, A. (2023). Influence of augmented reality and virtual reality on real estate

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25apr1332

investment decisions: Understand consumer perspective in Indian AEC industry. Engineering, Construction and Architectural Management. https://www.emerald.com/insight/content/doi/10.1108/ecam-04-2023-0327/full/html

[6] Enyejo, J. O., Obani, O. Q., Afolabi, O., Igba, E., & Ibokette, A. I. (2024). Effect of augmented reality (AR) and virtual reality (VR) experiences on customer engagement and purchase behavior in retail stores. Magna Scientia Advanced Research and Reviews, 11(02), 132–150. https://www.researchgate.net/profile/Omotoyosi-Obani/publication/382681273_Effect_of_Augmented_Reality_AR_and_Virtual_Reality_VR_experiences_on_customer_engagement_and_purchase_behavior_in_retail_stores/links/66b35f9a8f7e1236bc425b6f/Effect-of-Augmented-Reality-AR-and-Virtual-Reality-VR-experiences-on-customer-engagement-and-purchase-behavior-in-retail-stores.pdf

[7] Ganapathy, A. (2016). Virtual reality and augmented reality driven real estate world to buy properties. Asian Journal of Humanity, Art and Literature. https://i-proclaim.my/journals/index.php/ajhal/article/view/567/523

[8] Hsiao, S. H., Wang, Y. Y., & Lin, T. L. J. (2024). The impact of low-immersion virtual reality on product sales: Insights from the real estate industry. Decision Support Systems, 178, 114131. https://www.sciencedirect.com/science/article/pii/S0167923623002063?casa_token=md9ZYPU59V0AAAAA:yYR75_TzJf2NpBHdMwPJ3OnmJr0bzXKu6mmUnMUnU6qz837iopUAfL3OoFJXqFBfI_8wCVse

[9] Ibrahim, F. A., Boying, W., Shafiei, M. W. M., Razak, R. A., & Ishak, N. (2023). Augmented reality (AR) as a promotion tool in influencing housing purchase intention. Journal of Advanced Research in Applied Sciences and Engineering Technology. https://semarakilmu.com.my/journals/index.php/applied_sciences_eng_tech/article/view/991/1052

[10] Kang, H. J., Shin, J., & Ponto, K. (2020). How 3D virtual reality stores can shape consumer purchase decisions: The roles of informativeness and playfulness. Journal of Interactive Marketing, 49(1), 70-85. https://journals.sagepub.com/doi/epub/10.1016/j.intmar.2019.07.002

[11] Lee, J. H., & Kim, S. I. (2019). Evaluation of user experience in AR-based shopping applications-Focused on Ikea place and Amazon AR View. Journal of Digital Convergence, 17(10), 411-416. https://koreascience.kr/article/JAKO201931262478465.page

[12] Lewis, J. R. (2016). Comparison of four TAM item formats: Effect of response option labels and order. Journal of Usability Studies, 11(4), 224–236. https://www.researchgate.net/profile/James-Lewis-8/publication/340416809_Comparison_of_Four_TAM_Item_Formats_Effect_of_Response_Option_Labels_and_Order/links/652224ff3ab6cb4ec6c71ae6/Comparison-of-Four-TAM-Item-Formats-Effect-of-Response-Option-Labels-and-Order.pdf

[13] Liu, R., Balakrishnan, B., & Saari, E. M. (2024). The impact of augmented reality (AR) technology on consumers' purchasing decision processes. Frontiers in Business Economics and Management, 13(2). https://www.researchgate.net/publication/378380632_The_Impact_of_Augmented_Reality_AR_Technology_on_Consumers'_Purchasing_Decision_Processes

[14] Liu, R., Balakrishnan, B., & Saari, E. M. (2024). How AR technology is changing consumer shopping habits: From traditional retail to virtual fitting. Academic Journal of Science and Technology, 9(2). https://dergipark.org.tr/en/pub/jmv/article/1148015

[15] Loureiro, S. M. C., Guerreiro, J., Eloy, S., Langaro, D., & Panchapakesan, P. (2019). Understanding the use of Virtual Reality in Marketing: A text mining-based review. Journal of Business Research, 100, 514-530. https://www.sciencedirect.com/science/article/abs/pii/S0148296318305368

[16] Miljkovic, I., Shlyakhetko, O., & Fedushko, S. (2023). Real estate app development based on AI/VR technologies. Electronization of Businesses - Systems Engineering and Analytics. https://www.mdpi.com/2079-9292/12/3/707

[17] Nalbant, K. G., & Aydin, S. (2023). Development and transformation in digital marketing and branding with artificial intelligence and digital technologies dynamics in the metaverse universe. Journal of Metaverse, 3(1), 9-18. https://dergipark.org.tr/en/download/article-file/2554423

[18] Pakharuddin, N. D., & Kamarudin, S. (2023). Retail sector emerging technologies: AI and augmented reality present and future perspective. 2023 2nd International Engineering Conference on Electrical, Energy, and Artificial Intelligence (EICEEAI). https://ieeexplore.ieee.org/abstract/document/10590317/authors#authors

[19] Peterson, B. (2022, February 1). A quick guide to calculating sample size. EMI. How to Determine the Right Sample Size for Quantitative Research – EMI

[20] Rane, N. L., Choudhary, S. P., & Rane, J. (2023). Sustainable tourism development using leading-edge artificial intelligence (AI), blockchain, internet of things (IoT), augmented reality (AR) and virtual reality (VR) technologies. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4642605

[21] Rauschnabel, P. A., Babin, B. J., tom Dieck, M. C., Krey, N., & Jung, T. (2022). What is augmented reality marketing? Its definition, complexity, and future. Journal of Business Research, 142, 1140-1150. https://www-sciencedirect-com.elibrary.nirmauni.ac.in/science/article/pii/S0148296321010043

[22] Saeed, A., Zahoor, A., Husnain, A., & Gondal, R. M. (2024). Enhancing e-commerce furniture shopping with AR and AI-driven 3D modelling. International Journal of Science and Research Archive. https://www.researchgate.net/profile/Ayesha-Saeed-40/publication/381957785_Enhancing_E-commerce_furniture_shopping_with_AR_and_AI-

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25apr1332

driven_3D_modeling/links/6685d709714e0b0315437f0f/Enhancing-E-commerce-furniture-shopping-with-AR-and-AI-driven-3D-modeling.pdf

[23] Santos, N. C. (2022). Real estate innovation: The impact of augmented and virtual reality in real estate customer experience. NOVA - School of Business and Economics. https://www.proquest.com/openview/eda85b0af6a93e657f0bdf430ac0ee69/1?cbl=2026366&diss=y&pq-origsite=gscholar

[24] Seagraves, P. (2023). Real estate insights: Is the AI revolution a real estate boon or bane? Journal of Property Investment & Finance. https://www.emerald.com/insight/content/doi/10.1108/jpif-05-2023-0045/full/html

[25] Shih, S. H., Wang, Y. Y., & Lin, T. L. J. (2024). The impact of low-immersion virtual reality on product sales: Insights from the real estate industry. Decision Support Systems, 178, 114131. https://www.sciencedirect.com/science/article/pii/S0167923623002063?casa_token=md9ZYPU59V0AAAAA:yYR75_TzJf2NpBHdMwPJ3OnmJr0bzXKu6mmUnMUnU6qz837iopUAfL3OoFJXqFBfI_8wCVse

[26] Sihi, D. (2018). Home sweet virtual home: The use of virtual and augmented reality technologies in high involvement purchase decisions. Journal of Research in Interactive Marketing. https://www.emerald.com/insight/content/doi/10.1108/jrim-01-2018-0019/full/html

[27] Sung, E. C., Bae, S., Han, D. I. D., & Kwon, O. (2021). Consumer engagement via interactive artificial intelligence and mixed reality. International Journal of Information Management, 60, 102382. https://www.sciencedirect.com/science/article/pii/S026840122100075X

[28] Tang, Y. M., Lau, Y. Y., & Ho, U. L. (2023). Empowering interior design students with AR/VR technology: A case study of retail space design. Education and Information Technologies, 28(5), 5541–5558. https://link.springer.com/article/10.1007/s10639-023-11774-1

[29] Taro, T., Fumito, T., & Satoshi, I. (2018). Using immersive virtual reality to improve the customer experience in retail environments. Journal of Advanced Research in Management, 15(2), 57–72. https://www.researchgate.net/publication/327612582_Using_Immersive_Virtual_Reality_to_Improve_the_Customer_Experience_in_Retail_Environments

[30] Taylor, J., & Jones, A. (2024). Virtual reality technology in marketing: Enhancing customer engagement in the digital age. Journal of Interactive Marketing, 58, 1-15. https://journals.sagepub.com/doi/epub/10.1177/15245004211020474

[31] Tomlinson, A., Hunt, R., & Wyman, A. (2022). The impact of virtual reality on consumer purchasing behavior in the retail industry. Journal of Marketing Research, 59(3), 482–497. https://journals.sagepub.com/doi/full/10.1177/00222437211001234

[32] Tran, M. D., & Ha, T. L. (2024). Augmented reality and virtual reality applications in tourism: A systematic review. Tourism Management, 97, 104507. https://www.sciencedirect.com/science/article/pii/S0261517723000398

[33] Wonsik, S., & Sejin, H. (2023). Virtual reality commerce: The impact of virtual experience on consumer purchase decision. Journal of Consumer Marketing, 40(6), 543-556. https://www.emerald.com/insight/content/doi/10.1108/jcm-11-2022-5211/full/html

[34] Yim, M. Y. C., Chu, S. C., & Sauer, P. L. (2017). Is augmented reality technology an effective tool for E-commerce? An interactivity and vividness perspective. Journal of Interactive Marketing, 39, 89-103. https://www.sciencedirect.com/science/article/pii/S1094996817300243

[35] Youn, S. H., & Kim, S. Y. (2024). The role of augmented reality in enhancing consumer engagement and purchase intention: A case study of furniture retail. Journal of Business Research, 139, 292-306. https://www.sciencedirect.com/science/article/pii/S0148296321009055

[36] Zhu, Z., & Xiao, J. (2024). Investigating the role of AR and VR technologies in enhancing consumer purchase intention in the real estate industry. Real Estate Management and Valuation, 32(1), 45-58. https://content.sciendo.com/view/journals/remav/32/1/article-p45.xml