

FACTORS INFLUENCING CONSUMERS' PURCHASE OF FOURTH-GENERATION RESIDENCES: A QUANTITATIVE RESEARCH PERSPECTIVE

Yapei Zheng

An Independent Study submitted in partial fulfillment of the Requirements for the Degree of Master of Management
Program in Creative Industries Management
Rattanakosin International College of Creative Entrepreneurship
Rajamangala University of Technology Rattanakosin
Academic Year 2026
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Advisor: Songyu Jiang (Ph.D.); **Academic Year**: 2026

ABSTRACT

The objectives of this research/study were (1) to explore the influence of Environmental Sustainability (ES), Space Utilization (SU), Intelligent Degree (ID), and Residential Comfort (RC) on consumers' intention to purchase fourth-generation residences, (2) to analyze how perceived value affects consumers' purchase intention of fourth-generation residences, (3) to verify the mediating role of perceived value in the relationship between fourth-generation housing attributes and consumers' purchase intention.

This study adopted a quantitative research method, collecting data from 651 consumers of the fourth-generation residences via an online survey. Furthermore, this study used a structural equation model to process the data.

Major Findings: (1) On the first objective, this study reveals a clear hierarchy: Residential Comfort (RC) and Environmental Sustainability (ES) are the dominant drivers of purchase intention, while Space Utilization (SU) is non-significant and Intelligence Degree (ID) is only marginal, suggesting comfort and sustainability matter more than space efficiency and smartness; (2) On the second objective, this study reveals Perceived Value (PV) as the strongest and most proximal predictor of purchase intention, indicating decisions hinge on an overall “worth-it” value appraisal; (3) On the third objective, this study reveals Perceived Value (PV) as a significant, differentiated mediator: strong partial mediation for Environmental Sustainability (ES)/Residential Comfort (RC) and weaker, value-dependent mediation for Space Utilization (SU)/Intelligence Degree (ID).

Keywords: Fourth generation residence, Consumer purchasing decisions, Perceived value, Environmental protection characteristics, Market acceptance.

Advisor’s Signature…….

Acknowledgements

The Songkran Festival in Thailand has yet to begin, but my postgraduate life has quietly come to an end. The familiar sound of motorcycles outside the window still lingers, and my heart is filled with deep affection for this land.

First and foremost, I would like to express my deepest gratitude to my supervisor, Professor Jiang Songyu. Thank you for your meticulous guidance and patient assistance throughout the process of my thesis topic selection, model creation, and writing. Your rigorous academic attitude and profound knowledge have greatly benefited me, and the academic freedom and trust you granted me have taught me to think independently and explore.

I am also grateful to all the teachers at the School of Management and Creative Industries at Rajamangala University of Technology Rattanakosin for the inspiration and support they provided during my course studies and academic exchanges. Thank you to my fellow students and friends. Your company in this foreign land has made this journey of learning less lonely. The classroom discussions and weekend outings we shared will become my precious memories.

I am thankful to my parents who are far away. It is your support and encouragement that have given me the courage to face the challenges of life in a foreign country alone. Thank you for allowing me to grow independently in a foreign land while always being my stable home.

Finally, I would like to thank the version of myself who stood bewildered at Suvarnabhumi Airport with a suitcase two years ago. In these two years, I have gained professional knowledge and experienced the charm of diverse cultures, learning to view the world with a more open and inclusive mindset. This experience will be a valuable asset in my life.

This article is dedicated to all those who have helped me.

ขอขอบคุณจากใจจริง

Yapei Zheng

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List of Abbreviation and Glossary

Abbreviation /Glossary	Explanation
(A)	Attributes
(C)	Consequences
(AVE)	Average Variance Extracted
(CFA)	Confirmatory factor analysis
(CITC)	Corrected Item-total Correlation
(CR)	Composite Reliability
(CVT)	Consumer Value Theory
(ES)	Environmental Sustainability
(ESG)	Environmental Social and Governance
(ID)	Intelligence Level
(MEC)	Means–End Chain
(MVE)	Mean Variance Extraction
(PI)	Purchase Intention
(PV)	Perceived Value
(RC)	Residential Comfort
(SEM)	Structural equation modeling
(SU)	Space Utilization
(V)	Values

CHAPTER 1
INTRODUCTION

The first chapter examines the fourth-generation residential model, a new form of housing that integrates advanced technology with sustainable development principles. Its generational evolution progresses from the first generation, which primarily met basic survival needs, to the second generation that enhanced spatial efficiency but weakened natural connections, and finally to the third generation that introduced landscape design without fundamentally improving human interaction. The fourth-generation housing strengthens the bond between humans and nature through the concept of "gardens on every floor, courtyards in every household." It has gained consumer attention through eco-friendly technologies, smart devices, and improved living standards. Market data shows its higher sales rate compared to traditional housing, highlighting the necessity to study consumer decision-making motivations and market dynamics.

1.1 Research Background

1.1.1 Research problem statement

The fourth-generation residential model, as a modern housing innovation integrating advanced technology and sustainable development principles, has garnered significant consumer attention. The evolution of housing has progressed through four generations. The first-generation dwellings emphasized local resource utilization, primarily addressing basic survival needs. Due to technological limitations, people constructed homes using surrounding natural materials, with structures and layouts closely aligned with the environment (Arash et al., 2025). The second-generation emerged with architectural advancements, utilizing reinforced concrete for high-rise construction. As urbanization accelerated and land resources became scarce, this approach effectively optimized spatial efficiency to accommodate growing populations. However, the enclosed nature of high-rise buildings diminished residents' connection to nature. Predominantly concrete structures confined natural elements behind windows, while community designs

overlooked social needs, featured simplistic public spaces, and reduced neighborhood interactions (Elnagar et al., 2024). The third-generation residences began enhancing living environments beyond basic functionality, incorporating landscape design and social spaces (Zhong et al., 2023). Communities introduced greenery, leisure plazas, and small social venues to foster resident interaction through these facilities. However, landscape design is predominantly ornamental, resulting in superficial interactions between residents and nature. The lack of meaningful neighborhood engagement has not been fundamentally addressed, while underutilized public spaces fail to effectively foster residents' sense of belonging and community interaction (Li et al., 2025).

Currently, China's residential market is facing a series of profound practical problems. On the one hand, the traditional residential development model has shown signs of fatigue, with severe product homogenization, making it difficult to meet consumers' growing demands for personalization and quality (Sun et al., 2026).The proliferation of cookie-cutter high-rise concrete buildings has not only caused visual fatigue but also resulted in homogenized living experiences and a growing detachment in human connections (He et al., 2022).In high-density urban areas, pigeon-cage-like living spaces, shrinking public green spaces, and the persistent sense of confinement and oppression after returning home from hectic work exacerbate psychological stress and alienation among modern urban dwellers (Patwary et al., 2024).At the same time, as a major source of energy consumption and carbon emissions, the construction industry urgently needs to undergo a green transformation (Labaran et al., 2022). Traditional housing forms face significant challenges in energy conservation, emission reduction, and addressing climate change (Panakaduwa et al., 2024). These practical dilemmas collectively point to a core issue: how to create next-generation housing solutions that meet basic living needs, rebuild intimate connections between people and nature, and between people and their communities, while being environmentally friendly, all within the constraints of limited land resources.

The fourth-generation residential model has emerged as a response to modern living challenges, embodying the vision of "gardens within every floor and courtyards in every home" to address ecological shortcomings in contemporary housing while enhancing residents 'quality of life and meeting low-carbon, green, and eco-friendly standards (Li, 2024). As a cutting-edge residential form, it integrates advanced technologies

with sustainable development principles, garnering significant consumer attention. The evolution of residential landscapes—from the first to fourth generation—reflects humanity's ongoing redefinition of the relationship between living environments and nature. The fourth-generation design places people at the heart of natural ecosystems, strengthening connections through multiple interfaces: indoor-outdoor, elevated spaces-outdoor, vertical surfaces-ground, and ground-level sunrooms (Zhong et al., 2022). In an era of rapid population growth and dwindling resources, this approach revives the first-generation philosophy of harmony between nature and human well-being.

When selecting fourth-generation residences, consumers primarily consider the application of eco-friendly technologies, smart device integration, and enhanced quality of life (Goubran et al., 2023). These factors are crucial in shaping consumer decisions, making it essential to understand these motivations for market analysis. At the market level, demand for high-quality housing continues to grow. According to CRIC Research data, the supply of fourth-generation residences in various cities is expected to maintain growth through 2025, with over 70 new projects explicitly targeting this category. Nanjing and Xi'an have already announced 16 and 14 such projects respectively, indicating that fourth-generation residences will become the dominant force in the market. In terms of sales performance, the average initial sales rate for fourth-generation residences stands at 43%, surpassing the 25%-42% average in core cities during the same period, demonstrating strong market appeal.

Table 1. 1 Basic Information of Fourth Generation Housing Projects in Typical Cities in September 2025

City	Project	Plate	Number of Subscription Units Opened in September	September Sales Rate
Chengtu	Preface to the Investment Promotion in Chengcheng	Bali Village-Erxian Bridge	92	100%
Chengtu	Dongcheng Jinmao Xiaotang	Honghe River	34	100%
Chongqing	Huaqiao City Xichen	Shapingba Center	83	92%
Guangzhou	China Construction Maritime Silk Road City Phase II (China Construction Lingnan Sequence)	Huangpu	211	71%

Fourth-generation residences possess environmental protection characteristics such as energy conservation, emission reduction, and low-carbon emissions (Li, 2025), which significantly influence consumers 'home purchase intentions. Studying how these environmental advantages affect consumer decisions helps reveal the importance of environmental awareness in housing choices and assists in understanding consumers' emphasis on eco-friendly technologies (Tamboli et al., 2023). In terms of product innovation and design, China Jinmao launched its fourth-generation technological residential project, Jinmao Puyi Qujiang, in Xi 'an. As the global debut of Jinmao China [Puyi Series], it creates an international Oriental art piece in the city's core area. The project brings the "courtyard" to the sky, boasting exceptional "courtyard content," making it a rare large flat unit with an aerial courtyard among products of the same size in Xi'an. In terms of the innovative model of cultural tourism + residential, OCT A will inject cultural tourism genes into improved residential, realizing natural ecological construction and product innovation in the urban core area. For example, in Chongqing, it has developed Lingyu and Blue Bay, which introduce a natural and relaxed vacation feeling, and build a "micro vacation" lifestyle paradigm in the city.

In terms of perceived value, customer-perceived value refers to the comprehensive evaluation of product and service utility based on personal investment and returns. Fourth-generation residences offer multiple advantages including economic benefits, improved quality of life, and technological innovation. Consumers' perception of these values directly influences their purchasing intentions (Zhao & Chen, 2021). The Chongqing Xichen project stands out in this regard. OCT A has positioned its Chongqing project OCT Xichen as a fourth-generation premium residential product, deeply integrating the concepts of "urban retreat" and "forest-inspired living" through the "fourth-generation residence" framework. The project adopts a dual-platform model featuring "enclosed balconies + sky courtyards," further enhancing the internal conversion rate of unit layouts. With approximately 6.3-meter ceiling height and L-shaped sky courtyard designs, the project expands practical functions while optimizing spatial layout, lighting design, and privacy protection. In terms of community planning and amenities, OCT Xichen features an enclosed layout and "one core, two axes" planning system, connecting landscape spaces such as Qingyang Juchang, Qilin Yayuan, Lanyue Guanting, Liuguang Shuiyuan, Senyou Paradise, and Amber Garden, creating a multi-layered forest-dwelling atmosphere.

Whether technological innovations, such as smart home systems and automated control, can effectively enhance the market acceptance of fourth-generation residences is key to understanding market dynamics (Gøthesen et al., 2023). In recent years, the real estate industry has made breakthrough progress in the field of intelligence. Poly Development, in collaboration with Huawei, has developed a whole-house smart system, with 100% of projects delivered in 2025 pre-installed with AI temperature control and security linkage modules. In terms of smart home applications, fourth-generation residences generally adopt smart home systems, which not only improve living experiences but also help reduce long-term operational costs. Poly Development, in collaboration with Huawei, has created a "AI Butler" system for whole-house intelligence, achieving linkage between energy consumption management and safety alerts. The system is equipped with the DeepSeek-V3 large model, which automatically optimizes lighting, temperature, and humidity parameters through user behavior learning, increasing energy efficiency by 18%. These technological innovations not only enhance the intelligence level of residences but also provide consumers with unprecedented convenient living experiences, becoming an important driving force for the development of the fourth-generation residential market.

In terms of market performance, China Merchants Linyu Jing, as Guangzhou's first ultra-regulatory fourth-generation residential project, became one of the creators of Guangzhou's "sold-out in a day" in 2024. It achieved the "double crown" in both the number of units sold and sales area from January to February 2025. After a three-month wait, it reopened through a lottery, with the number of registrations exceeding three times the number of available units. The project sold 86% of its inventory on the opening day and 90% within two days, continuing to write the "legendary story" of high-quality living in Guangzhou for 2025. The fourth-generation residential products of China Development Corporation performed strongly in the market, with 70% of projects located in the Yangtze River Delta region. The premium rate for fourth-generation residences in Hefei and Hangzhou exceeded 30%, and the inventory turnover rate ranked first in the industry (0.89 times). The China Development · Yuehai project, which opened on March 29,2025, sold 176 units within two hours, achieving 80% sales within two hours and topping the sales charts in Haicang District for four consecutive months from April to May. The Chongqing Jinmao Puyin Jinkai project, as the first Chongqing project in the China Jinmao Puyin

series and the first pure fourth-generation residential project on Jinkai Avenue, made a stunning market impact in late March 2025 with "a first opening of 360 million yuan and a 90% sales rate." Building 1 of the project sold out immediately after obtaining certification, setting a new "ceiling" for the floor area unit price in Chongqing at approximately 29,100 yuan per square meter.

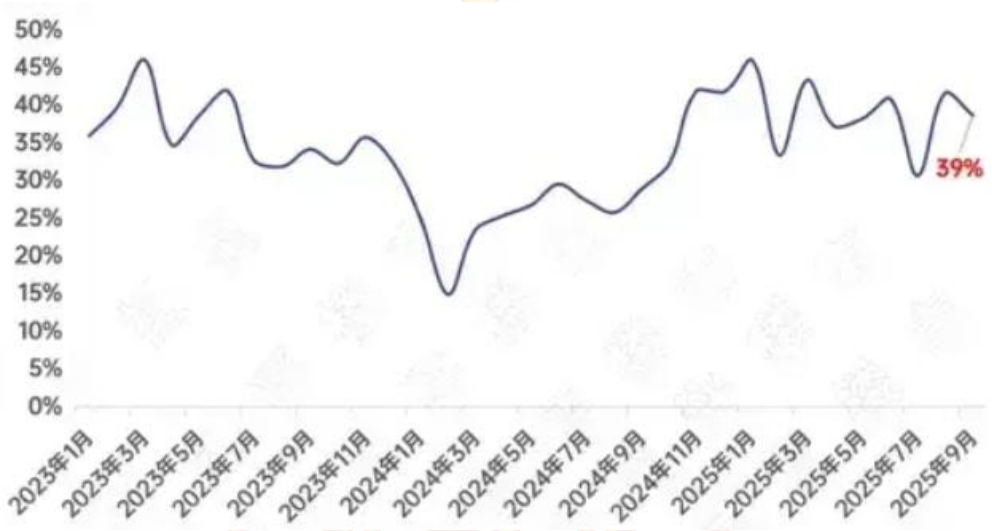


Figure 1. 1 Changes in average sales rate of 30 typical cities since January 2023

Source: CRIC China Real Estate Decision Consulting System
https://www.sohu.com/a/944405773_120438319

Figure 1.1 illustrates the average sales rate fluctuations across 30 representative cities from January 2023 to March 2025. March witnessed a notable market surge, driven by the traditional "Golden March and Silver April" sales peak season, with developers ramping up project launches and marketing efforts, pushing the market to its highest level this year. CRIC research data indicates that the average sales rate for new property launches in 29 key cities reached 45% in March, nearly matching the 2023 peak and continuing the steady upward trend.

Space utilization is a key feature of fourth-generation residences (Jian et al., 2025). Through the design concept of "gardens on every level and courtyards in every household," fourth-generation residences have significantly improved spatial efficiency. The OCT Xichen project has notably enhanced the internal conversion rate of unit layouts by adopting an innovative "enclosed balcony + sky courtyard" dual-platform model. With a

ceiling height of approximately 6.3 meters and an L-shaped sky courtyard design, the project expands practical functions while optimizing layout, lighting design, and privacy protection. This design not only enhances Residential Comfort but also provides consumers with higher spatial value. Market acceptance is rapidly increasing, with data showing that in the first half of 2024, about 70 projects in major Chinese cities achieved a delivery rate exceeding 100%, most of which were fourth-generation residences. In terms of sales performance, the average initial sales rate of fourth-generation residences was 43%, surpassing the overall sales rate of 25%-42% in core cities during the same period, demonstrating strong market appeal.

The comprehensive analysis of these issues will help us to understand the consumer demand and market dynamics of the fourth generation of housing, provide a scientific basis for market innovation and product development, and promote the widespread application of green building and smart home technology.

1.1.2 Research gap statements

As a cutting-edge architectural concept and market practice, the fourth-generation residential development has seen its evolution and market performance thoroughly analyzed in previous studies. However, academic research still lags significantly behind practical developments in explaining and supporting this phenomenon, with several critical gaps that hinder the full exploration of its market potential and effective guidance.

The theoretical framework lacks a comprehensive integration of objective product attributes and consumers 'subjective psychological factors. Existing studies either focus solely on the physical characteristics of residential properties or examine consumers' environmental attitudes in isolation (Kremer & Symmons, 2025; Mechuchep & Damnet, 2025). They fail to systematically connect four core attributes—environmental sustainability, spatial efficiency, smart technology integration, and Residential Comfor—with the ultimate "purchase intention" through the key psychological variable of "perceived value" (Srivastava et al., 2023).The intermediary role of perceived value and its specific influence path are still a "black box" that has not been empirically tested, which limits the deep understanding of the internal mechanism of consumer decision-making.

Consumer research has shown insufficient exploration of the underlying motivations and key barriers in decision-making. While the importance of factors like environmental protection and smart features is widely recognized, the mechanisms

through which these attributes translate into consumers' perceived functional, emotional, and social values remain inadequately analyzed (Basnet et al., 2024). Moreover, consumer perceptions of risks regarding new technology adoption, long-term maintenance, and privacy security—critical negative factors hindering purchase intent—have not received sufficient attention in existing studies. This lack of focus results in inadequate explanations for the entire consumer journey from "intention formation" to "decision action."

The market lacks systematic quantitative evidence to drive mass adoption. Current market understanding primarily relies on isolated case studies of successful projects, which, while demonstrating market viability, fail to reveal universal acceptance patterns. Key factors influencing mass market adoption and their relative importance remain unquantified through large-scale data analysis (Magara & Zhou, 2024). This systemic evidence gap hinders developers from making precise product positioning and marketing communications, while also depriving policymakers of solid references when designing incentive measures.

1.2 Significance of the Study

1.2.1 Theoretical Significance

The pursuit of green, low-carbon, ecological, and environmentally friendly goals forms the core philosophy of fourth-generation residential design. Research on this innovative approach not only advances architectural and environmental science but also drives progress in building technology and design concepts. As a pioneer in construction technology and design philosophy, fourth-generation residences demonstrate groundbreaking innovations in energy efficiency, eco-friendliness, and smart systems. These advancements not only deepen our understanding of sustainable architectural design but also propel the development of green building standards, introducing fresh perspectives and methodologies to the field of architecture.

Furthermore, studying the market acceptance and consumer decision-making motivations of fourth-generation homes can expand consumer behavior theory. When selecting fourth-generation homes, consumers 'focus on environmental protection, economic value, and quality of life reveals multiple psychological motivations and preferences in the decision-making process. Specifically, the emphasis on eco-friendly features (such as energy efficiency and low carbon emissions) demonstrates how

environmental awareness influences purchasing decisions, requiring the inclusion of green product preference explanations in consumer behavior models. Meanwhile, consumers' evaluation of economic benefits (e.g., long-term cost savings from energy conservation) highlights the critical role of financial considerations in home purchasing decisions, necessitating the incorporation of cost-benefit analysis in theoretical frameworks. Additionally, the appeal of smart home technologies and high-quality living standards in fourth-generation homes further enriches theoretical discussions on how quality of life impacts consumer choices.

In terms of perceived value, consumers value fourth-generation residences for their environmental benefits, economic advantages, and improved quality of life—factors that significantly influence home purchase decisions. Their perception of these values directly shapes buying intentions, making the study of perceived value crucial for refining consumer behavior theories and informing market development and product design strategies.

Perceived value is often accompanied by perceived risk and plays a key role in consumer decision-making. Consumers may harbor concerns about new technologies or unproven green standards, such as uncertainties regarding technical reliability or return on investment. Therefore, understanding these perceived risks is crucial to explaining consumer hesitation and the challenges in adopting fourth-generation housing.

In conclusion, the study of the fourth generation of housing will not only help to deepen the understanding of the complex behavior patterns of modern consumers in the environmentally and technology-driven market, but also provide a scientific basis for future market research and strategy formulation.

1.2.2 Practical Significance

The research of fourth generation housing can provide scientific basis for urban planners. Understanding the practical application effect and market demand of fourth generation housing can help to formulate more effective environmental protection policies, building codes and incentive measures, thus promoting the popularization and development of green building.

In the real estate sector, analyzing demand trends and consumer preferences for fourth-generation housing can drive market innovation. Developers and construction firms can leverage these insights to design and market residential products that meet market

needs, while promoting smart home systems and eco-friendly building materials. This not only accelerates industry upgrades but also provides practical guidance for implementing intelligent building solutions and energy-efficient technologies.

Enhancing living quality and standard constitutes another key practical significance of fourth-generation housing research. These residences typically feature superior energy efficiency and smart technologies, significantly improving residents 'convenience and comfort. By optimizing housing designs, such research can optimize living environments and elevate overall quality of life, playing a vital role in raising residents' living standards.

Finally, research on fourth-generation housing demonstrates direct impacts on environmental protection and sustainable development. These advanced residences have shown significant advantages in reducing energy consumption and carbon emissions. By studying their practical applications, we can provide actionable insights for future environmental protection efforts and drive sustainable development in the construction industry. Such research not only helps mitigate the negative environmental impacts of buildings but also supports global climate change mitigation initiatives.

1.3 Statement of Research Questions

(1) How do Environmental Sustainability, Space Utilization, Intelligence Degree and Residential Comfort affect purchase intention?

(2) How does perceived value influence consumers' purchase intention?

(3) How does perceived value play a mediating role in the relationship between fourth-generation housing attributes and consumers' purchasing intentions?

1.4 Statement of Research Objectives

(1) Explore the influence of Environmental Sustainability, Space Utilization, Intelligent Degree and Residential Comfort on consumers' intention to purchase the fourth generation of housing.

(2) Analyze how perceived value affects consumers' purchase intention of fourth-generation homes.

(3) To verify the mediating role of perceived value in the relationship between fourth-generation housing attributes and consumers' purchase intention.

1.5 Conclusion

The fourth-generation home embodies architectural innovation by integrating eco-friendly technologies, smart devices, and advanced design to enhance living quality and sustainability. With growing environmental awareness and technological advancements, consumer interest in this new housing model continues to rise. To explore this phenomenon, the study examines consumer decision-making factors, the impact of environmental protection features on choices, characteristics of perceived value, and the role of market acceptance for technological innovations.

The primary motivations for consumers choosing fourth-generation residences include the application of eco-friendly technologies, the use of smart devices, and improved quality of life. Understanding these factors helps reveal how consumers make decisions among various options. The energy-saving, emission-reducing, and low-carbon features of fourth-generation residences significantly influence homebuying intentions. Therefore, studying how these environmental advantages affect decision-making can help assess the actual impact of environmental awareness.

Regarding perceived value, the economic benefits, quality-of-life improvements, and technological innovations of fourth-generation residences significantly influence consumer purchasing intentions. Analyzing these perceived values provides crucial references for market development and product design. Moreover, understanding how technological innovations like smart home systems affect market acceptance is vital for comprehending market dynamics.

CHAPTER 2
LITERATURE REVIEW

As an innovative residential paradigm integrating green architecture principles, smart technologies, and human-centered design, the market acceptance of fourth-generation housing ultimately depends on consumer purchasing decisions. To systematically reveal the underlying mechanisms influencing consumer purchasing intentions, this chapter reviews and evaluates relevant theoretical frameworks and empirical studies to establish the research's theoretical foundation. First, we define the core concepts and characteristics of fourth-generation housing while examining its market evolution trends. Second, we conduct an in-depth analysis of key product attributes including environmental sustainability, spatial efficiency, smart technology integration, and Residential Comfor, alongside core psychological variables such as perceived value and purchase intent, clarifying their conceptual definitions and roles in consumption decision-making. Building upon eco-conscious behavior theory, we construct an integrated theoretical framework with perceived value as the central mediator, proposing research hypotheses to lay a solid academic foundation for subsequent empirical validation.

2.1 Research context

The fourth-generation residential model, also known as "sky courtyard houses" or "sky urban forest gardens," represents an innovative housing form developed through green building technologies (Li et al., 2022). It integrates sustainable development principles, smart technologies, and human living needs, emphasizing harmonious coexistence between humans and nature. Key features include courtyard-style layouts, vertical greening, and intelligent systems (Nachmany & Hananel, 2022). First proposed by Tsinghua University's School of Architecture, this concept introduces ground-level courtyards into multi-story residences, creating public or private green spaces on each floor. This approach transforms traditional concrete environments into more eco-friendly living spaces.

Li (2024) systematically articulated the core design philosophy of fourth-generation residences, characterized by "gardens on every floor and courtyards in every unit." They emphasized that through vertical greening and spatial innovation, these designs aim to redefine the relationship between humans and nature while elevating the aesthetic value of living spaces. This concept is currently transitioning from "premium upgrades" to "essential housing needs" in the market. Media reports by Cavelius et al. (2023) highlight the emergence of compact, low-cost fourth-generation residential products, signaling an expansion in market positioning and a new trend toward "essential housing needs." This development provides a fresh perspective for studying public market acceptance of such products.

The theoretical framework of fourth-generation residential research encompasses key concepts including green building theory, ecological landscape design, and smart home systems. Green building theory emphasizes energy efficiency, environmental protection, and low-carbon emissions, advocating sustainable architectural design strategies (Jamaludin & Li, 2023). Ecological landscape design focuses on integrating living environments with natural ecosystems, highlighting the multidimensional development of residential green spaces to enhance comfort (Vinczeová & Tóth, 2025). Smart home systems primarily involve the application of IoT technology, enabling higher levels of automation and intelligence in residences to improve convenience and safety (Torres-Hernandez et al., 2025).

In practical applications, architectural design emphasizes the integration of courtyards with greenery, spatial optimization, and ecological landscapes. By expanding green spaces and optimizing layouts, it enhances both Residential Comfort and aesthetic appeal. The real estate market prioritizes product differentiation and competitiveness, pricing products based on consumers' willingness to pay for green housing and developing targeted marketing strategies to boost brand recognition and acceptance. In smart home applications, IoT technology enables device interconnectivity and remote control. Through integrated smart systems, residential intelligence is elevated, delivering convenient and intelligent living experiences for residents.

Consumers 'purchase intention for green housing is a complex decision-making process. Multiple scholars have found through empirical research that perceived value serves as the core driving factor. Studies by Huang (2022), as well as Kumar et al. (2025),

confirm that consumers' perception of green housing's functional, emotional, and economic values significantly enhances purchase intent. Wang and Zhu (2025) further support the path through which green building design influences consumer decisions by improving living quality.

Beyond value perception, individual psychological traits play a pivotal role. Research by Jing and Rasiah (2025) and Gunawan et al. (2025) has demonstrated that environmental responsibility serves as a key driver of green consumption. Consumers with strong environmental awareness are more likely to recognize the value of green housing and develop purchasing intentions. Essoussi et al. (2025) employed grounded theory to reveal the complex interplay of influencing factors, showing that attitudes, subjective norms, and behavioral control collectively shape purchase intent.

The Green Residential Value Field Effect Theory proposed by Zhang et al. (2019) provides a macroscopic perspective for understanding this issue. The theory posits that the value of green residential properties is not determined solely by the product itself, but rather generated and amplified by a "field" composed of technology, market, policy, and social environment. This suggests that research on fourth-generation housing requires a systematic framework.

In the fourth-generation residential sector, architectural designs emphasize the integration of courtyards with greenery, spatial optimization, and ecological landscapes. The real estate market prioritizes product differentiation and competitiveness, while smart home systems leverage IoT technology to enable device interconnectivity and remote control. These applications reflect the refinement and promotion of green building standards, with smart home systems becoming increasingly integrated with fourth-generation residences. Concurrently, growing attention is being paid to the impact of residential landscape design on mental health and the economic feasibility analysis of fourth-generation homes, driving their widespread market adoption and sustainable development.

2.2 Parent discipline

2.2.1 Consumer Value Theory

Consumer Value Theory (CVT) explains that consumers’ decisions are driven by an overall evaluation of what they gain versus what they give up, and this evaluation is

multidimensional rather than purely price-based (Kumar, 2017). In your study, this logic aligns directly with the role of perceived value (PV) as “the overall evaluation of product utility based on the trade-off between perceived benefits and costs,” and with PV being composed of functional, emotional, social, and economic value dimensions. In other words, CVT provides a clean theoretical bridge from objective housing attributes (what the product offers) to subjective consumer judgments (how those attributes become meaningful value), which then shape purchase intention (PI). This is especially suitable for fourth-generation residences because consumers are evaluating a “bundle” of benefits (green performance, smart systems, comfort, spatial efficiency) that must be mentally converted into lived value before an intention to buy forms.

The main advantage of CVT in your research is that it justifies perceived value as the central mechanism (mediator) linking the four key attributes to purchase intention, rather than assuming attributes automatically translate into buying decisions. Your literature review already states that these standout attributes “ultimately influence purchasing decisions by translating into multidimensional perceived value,” where healthier living and convenience map to functional value, pride/satisfaction maps to emotional value, green identity maps to social value, and long-term savings map to economic value. This CVT lens strengthens your framework because it explains why the same product features can generate different purchase intentions across consumers: the decisive factor is not the feature itself, but how strongly the feature is perceived as valuable (and which value dimension it activates).

Based on CVT, the key theory-derived variables in your model can be specified as follows: (1) Value antecedents (product attributes)—Environmental Sustainability (ES), Space Utilization (SU), Intelligence Level (ID), and Residential Comfort (RC) as the sources of value perceptions; (2) Core evaluative variable—Perceived Value (PV), operationalized as a multidimensional construct (functional, emotional, social, economic); and (3) Behavioral outcome—Purchase Intention (PI). Conceptually, CVT also supports adding (if you decide later) perceived sacrifice/cost (e.g., price burden, maintenance cost) and perceived risk (e.g., technology reliability/privacy concerns) as “negative value” components that can weaken PV and reduce PI—consistent with your earlier emphasis that value judgments are benefit–cost trade-offs.

2.2.2 Means–End Chain (MEC) Theory

Means–End Chain (MEC) theory explains consumer choice as a hierarchical cognitive linkage from product attributes (means) to perceived consequences/benefits and ultimately to personal values (ends) (Chiu, 2005). In this view, consumers do not purchase technical attributes per se; rather, they purchase what those attributes do for them (e.g., convenience, safety, health, savings) and how such outcomes align with higher-order goals (e.g., quality of life, moral fulfillment, social image). This logic fits your study's decision-making chain that moves from "objective housing attributes" to "psychological evaluation" and then to "behavioral intention," emphasizing that attributes must first be internalized and interpreted before they translate into purchase intent.

The theoretical advantage of adopting MEC in your research is that it strengthens the explanatory mechanism behind why fourth-generation housing attributes influence purchase intention indirectly. Your framework already argues that perceived value is a multidimensional, cost–benefit evaluation and a central psychological variable through which the exceptional attributes of fourth-generation residences are aggregated and converted into explicit purchase intent. MEC provides a clearer micro-level rationale for this mediation: it specifies how consumers mentally translate concrete attributes into lived consequences (functional, emotional, social, economic) and then into higher-level value fulfillment—thereby offering a theoretically grounded pathway rather than a purely empirical association between attributes and intention.

Derived from MEC, your model variables can be articulated in a structured A–C–V chain: Attributes (A) include the four objective housing features—environmental sustainability, space utilization/efficiency, intelligence level (smart technology integration), and residential comfort. Consequences (C) refer to the consumer-perceived outcomes these attributes generate, such as improved convenience and safety (from smart technologies), enhanced health and well-being (from comfort and green features), better practicality and "value for money" experience (from space efficiency), and long-term cost savings (from energy-efficient systems). Values (V) capture the higher-order ends these consequences satisfy—e.g., environmental responsibility and moral fulfillment, lifestyle modernity, and desired quality of life—which are operationalized in your framework through perceived value (functional, emotional, social, economic) as the integrative psychological evaluation that ultimately drives purchase intention.

2.3 Immediate discipline

2.3.1 Environmental Sustainability

Environmental sustainability refers to meeting the needs of current generations without compromising the ability of future generations to meet theirs (Goodland, 1995). This involves the rational use of natural resources, protection of ecosystems, and reduction of pollution and greenhouse gas emissions to promote economic development and social progress. As a core principle in modern architectural development, it emphasizes fulfilling present needs without compromising future generations' capacity for development. This philosophy has been deeply integrated into every aspect from engineering design to material application (Goubran & Cucuzzella, 2019). Poorisat et al. (2024) points out that sustainable environmental engineering design focuses on resource recycling and pollution prevention, which aligns closely with the practices of fourth-generation housing that achieve efficient resource utilization through rainwater harvesting and energy-saving systems. At the material level, research by Jaradat et al. (2024) jointly highlights the significant environmental benefits brought by sustainable materials and green building materials in the construction field, including reduced carbon emissions and lower environmental impact throughout the lifecycle. This provides theoretical support for fourth-generation housing to adopt green building materials to enhance their eco-friendly attributes. These micro-level technical practices collectively serve the macro-level sustainable development strategies and urban ecological protection goals discussed by Li (2025), namely promoting harmonious coexistence between urban living environments and natural systems through green buildings.

The value of environmental sustainability becomes evident when applied to consumer decision-making scenarios. For potential buyers of fourth-generation residences, the energy-saving, emission-reduction, and low-carbon eco-friendly features not only align with their inherent environmental values but also deliver tangible functional and economic benefits. For instance, efficient energy-saving systems significantly reduce long-term utility costs, while green building materials ensure indoor environmental health and safety—practical advantages that consumers can clearly perceive. Furthermore, the Environmental, Social, and Governance (ESG) framework proposed by Elmor et al. (2025) indicates that corporate environmental performance is becoming a crucial consideration in brand selection. Therefore, a fourth-generation residential project demonstrating

outstanding environmental sustainability is not just a provider of physical space, but also a commitment to responsible living that meets consumers 'deep-seated needs for emotional value (such as residential pride and satisfaction from contributing to environmental protection) and social value (such as enhancing personal green image). Agrawal et al. (2025)'s research on corporate site selection and environmental impact assessments indirectly suggests that developers prioritizing environmental sustainability during project planning will gain greater market trust in their final products. Through analyzing these dimensions, environmental sustainability emerges as a key driver influencing consumers' willingness to purchase fourth-generation residences by creating comprehensive value across functional, emotional, and economic dimensions.

2.3.2 Space Utilization

The space utilization refers to the proportion of effectively utilized space to total area in a building or site. The effective space includes actual usable areas for living or working, excluding non-functional elements like corridors, staircases, and elevators (Feuerbacher, 2006). Amidst increasingly scarce land resources and soaring housing prices, space utilization has become a key metric for evaluating residential value and practicality. It represents the degree to which optimized design maximizes functionality per unit area while minimizing spatial waste (Lo et al., 2022). Zhou et al. (2024) emphasizes in architectural research that rational spatial layout is crucial for improving efficiency, directly impacting Residential Comfor and convenience. This philosophy is epitomized in fourth-generation residences, which transform traditionally neglected vertical and transitional spaces into functional courtyard areas through innovative designs like "gardens on every floor, courtyards in every unit" – essentially marking a revolutionary upgrade in spatial utilization models.

Modern technology provides new tools for understanding and optimizing spatial utilization. The research by Song and Calautit (2025) demonstrates how sensors and machine learning can non-invasively estimate spatial occupancy and usage patterns, indicating that future smart homes could achieve intelligent efficiency improvements by dynamically sensing residents 'behaviors and automatically adjusting spatial functions and energy configurations. At the micro level, Cheng et al. (2025)' s study on resilient kitchen storage spaces from a sustainability perspective, along with Staehr et al. (2025)'s exploration of high spatial utilization in industrial buildings, collectively point to universal

principles for tapping spatial potential through refined, modular, and adaptable designs. When applied to fourth-generation residences, these principles manifest as specific features like flexible spatial design, three-dimensional storage systems, and open layouts, significantly enhancing both practicality and cost-effectiveness.

From a consumer perspective, efficient spatial utilization directly creates tangible multi-dimensional value. Firstly, it delivers significant functional benefits, such as expanding possibilities for family activities and optimizing movement patterns with enhanced natural lighting. Secondly, it carries substantial economic value. In the context of high housing prices, efficient space design means higher usable floor area ratios and optimal returns per square meter, which directly alleviates buyers 'cost-related anxieties. Lastly, a well-organized living space generates positive emotional value by reducing feelings of confinement and boosting overall comfort and satisfaction. Therefore, the spatial innovation in fourth-generation residences represents not only a technological breakthrough but also a key market competitive advantage that positively influences purchasing intentions by elevating consumers' comprehensive perceived value.

2.3.3 Intelligence Degree

The intelligence level of residential properties, defined by the integration of IoT and AI technologies to create smart home systems with automated control and personalized services, has become a key indicator of modernization and market appeal (Neisser, 1979). Research by Li et al. (2025) highlights the rapid growth and widespread industry adoption of smart home solutions, whose core value lies in delivering unprecedented convenience, security, and efficiency through interconnected devices. This technology-driven transformation in lifestyle forms the foundation of consumer-perceived value.

Intelligent systems generate value through multiple pathways. As evidenced by Khan et al. (2024)'s analysis of smart home robot trends and Li et al. (2025)'s exploration of intelligent building design, features like smart security, automated environmental control, and voice-enabled connectivity directly enhance residential functionality, addressing consumers 'core needs for safety, convenience, and comfort. Furthermore, Ferreira dos Santos et al. (2025)' s research on AI-driven urban intelligence demonstrates how smart technologies optimize system performance at a deeper level. In residential applications, this means intelligent systems can learn user habits through AI, automatically

adjusting parameters like lighting, temperature, and humidity. This not only improves comfort but also achieves significant energy savings, delivering long-term economic value to consumers.

For fourth-generation residences, high intelligence is not only a hallmark distinguishing them from traditional homes but also the key to fulfilling the promise of "high-quality living." When consumers perceive smart systems as effectively reducing daily hassles, ensuring home safety, and lowering long-term energy costs, their perceived value of these residences will significantly increase. This positive evaluation directly translates into stronger purchasing intent. Meanwhile, market concerns about technical reliability, privacy security, and maintenance costs may also pose perceived risks.

2.3.4 Residential Comfort

Residential comfort is an environmental adaptability evaluation system constructed through physical conditions, cultural ambiance, and public services. As a core comprehensive indicator for measuring housing quality, it encompasses multiple dimensions including physical environment, psychological experience, and spatial design, directly determining residents' quality of life and satisfaction (Liu & Wu, 2023; Xiang et al., 2025). From an architectural perspective, the indoor physical environment—comprising temperature/humidity control, lighting/ventilation, and sound insulation—forms the foundation of basic comfort (Chen et al., 2025). This concept has been further explored in green housing research, with Gil-Ozoudeh et al. (2022) both emphasizing that green building and structural designs can passively stabilize indoor environments through energy-efficient materials and optimized envelope systems, thereby fundamentally enhancing Residential Comfort. The vertical greening systems widely adopted in fourth-generation residences not only provide shading, cooling, and air purification but also directly improve indoor microclimates, representing the ultimate pursuit of physical environmental comfort.

With technological advancements, the concept of comfort is evolving from static, passive to dynamic, proactive dimensions. Research by Zaharieva et al. (2023) demonstrates the feasibility of dynamically enhancing residential comfort through intelligent systems and predictive models. This indicates that real-time AI regulation of indoor temperature, humidity, and lighting will become standard features in future residences, providing theoretical support for the comfort-oriented design of fourth-

generation smart homes. Beyond physical parameters, interior decoration and spatial design profoundly influence residents 'psychological comfort. Obeidat and Obeidat (2024)'s study confirms that rational spatial layouts, streamlined designs, and visual aesthetics significantly boost living satisfaction. The "courtyard-per-household" design of fourth-generation residences not only expands activity spaces but also introduces natural landscapes to provide visual transparency and psychological relaxation benefits. This aligns with Neto et al. (2025)'s emphasis that residential comfort evaluation should incorporate psychological and environmental factors.

For consumers, Residential Comfort is not an abstract concept but translates into tangible functional and emotional value. A home that is warm in winter, cool in summer, quiet yet bright, and well-designed offers greater daily convenience and health security (Knyziak,2019). When fourth-generation residences elevate this comfort to levels unattainable by traditional homes through green technologies and smart systems, they establish formidable market competitiveness. Consumers' pursuit of high-quality living significantly enhances their positive perception of products, effectively stimulating purchasing intent and making them willing to pay premium prices for improved quality of life.

2.3.5 Perceived Value

Perceived value, as a core psychological variable linking product attributes and consumer decisions, refers to consumers 'overall evaluation of product utility based on the trade-off between perceived benefits and costs (Sánchez-Fernández & Iniesta-Bonillo, 2007; Sweeney & Soutar, 2001). Research indicates this multidimensional construct plays a pivotal mediating role in green consumption. Xu et al. (2024) demonstrated its mediating effect between external environmental factors and behavioral intention in agricultural green production studies, while Nik Abdul Rashid and Shaharudin (2017) specifically validated that consumers' positive perception of a home's eco-friendly features and economic benefits significantly enhances purchase intent in green residential properties.

Perceived value encompasses multiple dimensions including functional, emotional, social, and economic aspects. Functional value reflects the practical utility of products, such as energy efficiency and health benefits in green residential buildings. Emotional value stems from the pleasure and satisfaction derived during usage, as evidenced by the positive impact of environmental experiences on mental health, as discovered by Zhao and

Weng (2024) in urban forest park research. Social value relates to identity expression and group belonging, with Xu et al. (2025) demonstrating that eco-conscious consumption behaviors help consumers build a responsible social image. These value dimensions collectively form the foundation for consumer decision-making.

In the context of fourth-generation housing, its standout attributes—environmental sustainability, spatial efficiency, smart technology integration, and comfort—ultimately influence purchasing decisions by translating into multidimensional perceived value for consumers. When buyers recognize these homes deliver healthier living environments (functional value), foster a sense of pride in their residence (emotional value), demonstrate environmental commitment (social value), and offer long-term economic benefits (economic value), their purchase intent significantly increases. As Adiwijaya and N (2023) noted, experiential marketing effectively boosts purchase intent by enhancing customer perception. This highlights that marketing strategies for fourth-generation housing should prioritize value communication and immersive experience design.

2.3.6 Purchase Intention

Purchase intention refers to the degree to which consumers develop subjective psychological inclination toward a product or service under specific circumstances and plan to take purchasing action (Peña-García et al., 2020). It is typically measured using scales such as "willingness to purchase," "willingness to pay premium price," and "willingness to recommend intensity," serving as one of the most stable antecedent variables for predicting actual purchasing behavior (Hsin Chang & Wang, 2011). As a key variable connecting consumer psychology with final purchasing decisions, it holds core predictive value in the consumption decision-making process. Existing research indicates that purchase intention is influenced by multiple complex factors, with perceived value proven to be the most stable predictor (Peña-García et al., 2020; Xing et al., 2025). Empirical studies by Wang et al. (2024) found that perceived value plays a full mediating role between customized marketing and purchase intention, a mechanism equally applicable in fourth-generation residential consumption scenarios—where consumers 'value perception of a home's environmental sustainability, spatial efficiency, and smart technology levels directly translates into purchase intention.

The formation of purchase intention follows multidimensional pathways. Zheng et al. (2025)'s research demonstrates how multi-dimensional interactions on social media platforms foster brand trust and emotional connections, thereby enhancing purchase intent. Meanwhile, Xie and Desouza (2025) revealed through grounded theory that the immersive experience and real-time interactivity of e-commerce livestreaming significantly boost consumer purchasing willingness. These findings provide theoretical support for digital marketing strategies in fourth-generation residential projects, showing that immersive content presentation and social engagement can effectively elevate consumer awareness and purchase propensity.

The formation mechanism of purchase intention in green consumption exhibits unique characteristics. Research by Masud et al. (2025) demonstrates that environmental ethics and circular economy knowledge influence consumers 'attitudes and subjective norms, thereby enhancing their willingness to purchase recycled products. Prayoga et al. (2020) further revealed that customer-perceived externality—consumers' awareness of the environmental and social impacts of their actions—serves as a key driver of green purchasing behavior. These studies provide crucial insights into the consumption motivations behind fourth-generation residences, revealing that environmental responsibility and sustainable development concepts act as significant psychological drivers for consumers to choose eco-friendly housing.

2.4 Hypothesis development

Building upon the theoretical foundations of the aforementioned literature review, this study develops an integrated theoretical framework to elucidate the decision-making mechanisms of consumers purchasing fourth-generation residences. The framework's core proposition is that the four key attributes of fourth-generation residences—environmental sustainability, spatial efficiency, smart technology integration, and Residential Comfort—do not directly influence purchase intent. Instead, they indirectly shape purchasing decisions by enhancing perceived value, a critical psychological variable. Perceived value serves as the central mediating factor, acting as a bridge between product attributes and consumer behavioral intentions. The following sections systematically examine the logical relationships among these variables and propose corresponding research hypotheses.

Environmental sustainability refers to a residence's capacity to minimize resource consumption and ecological impact throughout its entire lifecycle. This encompasses vertical greening, energy-efficient systems, rainwater harvesting, and the use of green building materials (Rowe et al., 2022). According to eco-conscious behavior theory, environmentally conscious consumers develop positive emotional responses (e.g., moral satisfaction) and pragmatic evaluations (e.g., long-term cost savings) when their environmental values align with a home's ecological features (Šostar & Ristanović, 2024). The emotional and functional benefits derived from eco-friendly attributes significantly enhance consumers' overall value perception of the residence. Therefore, this paper proposes the following hypothesis:

H1. The environmental sustainability of residential buildings has a significant positive impact on consumers' perceived value.

H10: Environmental Sustainability (ES) has a positive impact on Purchase Intention (PI).

Space utilization efficiency refers to the degree to which functional maximization and spatial waste minimization are achieved per unit area through optimized design, specifically manifested in flexible space design, three-dimensional storage systems, and open layouts (Šostar & Ristanović, 2024). In a market context marked by scarce land resources and soaring housing prices, efficient space utilization is directly linked to the practicality and cost-effectiveness of residential properties (Eliasson & Westerlund, 2023).When consumers believe that the residential design can meet their functional needs to the extreme and bring them a "value for money" experience, their perceived value will be enhanced (Reisinger et al., 2021). In terms of space utilization, this paper selects variable space design, three-dimensional storage system and open layout as the research factors of this variable, and proposes the hypothesis:

H2. The spatial utilization rate of residential buildings has a significant positive impact on the perceived value of consumers.

H11: Space Utilization（SU）has a positive impact on Purchase Intention（PI).

The level of intelligence reflects a residence's capability to integrate smart home systems through technologies like IoT and AI, enabling automated control and personalized services. Typical applications include smart security, automated environmental regulation, and voice-controlled appliance connectivity (Venkatraman et al., 2021). By delivering

unprecedented convenience, enhanced security, and energy efficiency management, intelligent technologies create significant functional and economic value for consumers. When consumers expect these technologies to improve their quality of life, positive value judgments about the residence will be formed (Sun et al., 2023). As for the degree of intelligence, this paper chooses intelligent security, automatic environmental control and home appliance voice interconnection as the research factors of this variable, and puts forward the hypothesis:

H3. The degree of intelligent housing has a significant positive impact on the perceived value of consumers.

H12: Intelligent Degree (ID) has a positive impact on Purchase Intention (PI).

Residential comfort refers to the holistic physical and psychological satisfaction provided by a home, serving as a comprehensive core indicator for evaluating living quality. It encompasses factors such as indoor lighting and ventilation, visual landscapes, community noise control, and indoor temperature and humidity (Chen et al., 2025). Comfort directly impacts residents' health and well-being, as well as their daily life satisfaction, representing both the most fundamental and highest-level value pursuit in housing (Muianga et al., 2021).A residence that performs excellently in comfort can directly meet consumers' emotional and functional needs for a high-quality life, thereby greatly enhancing its perceived value (Liu et al., 2025). Regarding Residential comfort, this paper selects indoor lighting and ventilation, view and landscape, community noise control, and indoor temperature and humidity as the research factors of this variable, and proposes the hypothesis:

H4. residential comfort has a significant positive impact on consumers.

H13: Residential Comfort (RC) has a positive impact on Purchase Intention (PI).

Consumer behavior theory posits that perceived value—the comprehensive evaluation of a product's utility based on the balance between perceived benefits and costs—is the most direct predictor of purchase intent (Misra et al., 2022). When consumers perceive high functional, emotional, social, or economic value in fourth-generation residences, their willingness to purchase significantly increases (Wang et al., 2021). This study focuses on the functional, emotional, and economic dimensions of perceived value as key research factors, and proposes the following hypotheses:

H5: The perceived value of the fourth generation of housing is significantly positively correlated with the purchase intention of consumers.

After clarifying how each antecedent variable influences perceived value and how perceived value drives purchase intent, this study proposes a comprehensive mediation model. The core argument of this model is that the exceptional attributes of fourth-generation residences first aggregate and enhance consumers' overall perceived value, which is then amplified and ultimately translated into explicit purchase intent. The theoretical foundations of the four mediation pathways will be discussed separately below.

Regarding the mediating pathways of environmental sustainability, Nascimento and Loureiro (2024) proposed a green consumption cognition-emotion system model. The environmental attributes of products, as external cognitive cues, must effectively translate into behavioral motivation by evoking emotional resonance (e.g., pride in living in an eco-friendly home) and utilitarian calculations (e.g., energy cost savings, making consumers feel "getting more than their money's worth"). Environmental sustainability itself is an abstract concept that requires consumers to concretely perceive its emotional value (e.g., moral satisfaction from contributing to environmental protection), social value (e.g., showcasing a green image), and economic value (e.g., long-term energy-saving benefits) to effectively drive purchasing behavior. Therefore, we infer that perceived value serves as the key psychological mechanism in this transformation process. Based on this, we propose the following hypothesis:

H6: Perceived value mediates the relationship between environmental sustainability and purchase intention.

The space-behavior theory posits that architectural design shapes users' behavioral decisions by influencing their functional experiences and psychological perceptions (Strachan-Regan & Baumann, 2024). High spatial efficiency creates strong perceived functional and economic value through delivering exceptional convenience and the psychological assurance of "every square meter being fully utilized." Consumers do not pay for the technical metric of "high efficiency" directly, but rather pay a premium for the resulting value perceptions of "spaciousness, practicality, and cost-effectiveness." Their purchasing intent becomes more strongly stimulated when they perceive the space as efficiently utilized, forming value judgments like "compact yet fully functional" and "high cost-effectiveness (Chatziioannou et al., 2025)." Therefore, we propose the

following hypothesis:

H7: Perceived value mediates the relationship between spatial utilization rate and purchase intention.

Evolutionary research on the Technology Acceptance Model (TAM) highlights that core constructs like perceived usefulness and perceived ease of use ultimately drive adoption behaviors by shaping users' overall value judgments (Davis, 1989). For high-tech residential properties, consumers must perceive technological advantages—such as automated controls and security alerts—as improvements in quality of life, including greater convenience, safety, and efficiency. This perception enhances both functional and emotional value (reducing life anxiety and improving daily convenience), thereby strongly motivating purchase intent. Technology itself is merely a tool; its true value lies in the perceived enhancement of daily life. Therefore, we propose the following hypothesis:

H8: Perceived value mediates the relationship between the degree of intelligence and purchase intention.

Both environmental psychology and consumer research widely recognize comfort as a fundamental experiential benefit that directly relates to consumers 'health and emotional values (Maduku, 2024). A comfortable living environment—featuring optimal lighting, ventilation, and a tranquil community—contributes to physical and mental well-being, delivering the most tangible and profound utility that consumers can directly perceive. The impact of residential comfort on purchase intent is almost entirely determined by consumers' valuation of these health and pleasure experiences. Therefore, we propose the following hypothesis:

H9: Perceived value mediates the relationship between residential comfort and purchase intention.

Table 2. 1 Hypothesis Development Statement

H1	The environmental sustainability of residential buildings has a significant positive impact on the perceived value of consumers.
H2	The residential space utilization rate has a significant positive impact on the perceived value of consumers.
H3	The degree of intelligent housing has a significant positive impact on the perceived value of consumers.

Table 2. 1 (Continued)

H4	The residential comfort has a significant positive impact on the perceived value of consumers.
H5	The perceived value of the fourth generation of housing is significantly positively correlated with the purchase intention.
H6	Perceived value mediates the relationship between environmental sustainability and purchase intention.
H7	Perceived value mediates the relationship between space utilization and purchase intention.
H8	Perceived value plays a mediating role between the degree of intelligence and purchase intention.
H9	Perceived value plays a mediating role between Residential comfort and purchase intention.
H10	Environmental Sustainability (ES) has a positive impact on Purchase Intention (PI).
H11	Space Utilization（SU）has a positive impact on Purchase Intention（PI).
H12	Intelligent Degree (ID) has a positive impact on Purchase Intention (PI).
H13	Residential Comfort（RC）has a positive impact on Purchase Intention (PI).

2.5 Theoretical framework

The theoretical framework developed in this study synthesizes core constructs from both pro-environmental behavior theory and consumer behavior theory, aiming to systematically elucidate the underlying mechanisms influencing consumers 'decision-making for fourth-generation homes. The model specifically examines four key attributes of fourth-generation residences—environmental sustainability, spatial efficiency, smart technology integration, and Residential comfort—and analyzes how these attributes shape consumers' perceived value, ultimately driving their purchase intent.

The framework highlights those residential properties 'objective attributes fundamentally shape consumers' subjective psychological evaluations. Specifically, environmental sustainability features (e.g., vertical greenery and energy-efficient systems) align with eco-friendly behavior theories, fulfilling consumers 'dual value needs of environmental responsibility and moral fulfillment. Spatial efficiency (e.g., flexible layouts and multi-level storage) and Residential comfort (e.g., natural lighting, ventilation, and community noise control) directly impact functional utility and health well-being, forming the functional and emotional foundations of perceived value. Meanwhile, smart

technologies (e.g., intelligent security systems and climate control) enhance modern living experiences and economic efficiency through convenience and safety guarantees. These attributes collectively influence consumers' perceived value—a multidimensional construct resulting from comprehensive cost-benefit analysis (covering functional, emotional, social, and economic dimensions).

The model establishes two pathways: direct and mediating effects. The direct pathway demonstrates that the four core attributes significantly enhance perceived value (H1-H4), which directly drives purchase intention (H5). Crucially, the model proposes a comprehensive mediating mechanism: these attributes do not directly influence purchase intention but primarily operate indirectly by elevating perceived value as the central psychological variable (H6-H9). This indicates that the exceptional qualities of a residence must first be internalized and interpreted by consumers as higher "value" before effectively translating into explicit purchase intent.

This comprehensive framework clearly reveals the complete decision-making chain from the "objective attribute of the residence" to the "psychological perception of the consumer" and then to the "final behavioral intention", which provides a systematic theoretical perspective for the in-depth understanding of how consumers evaluate and choose the fourth generation of residence.

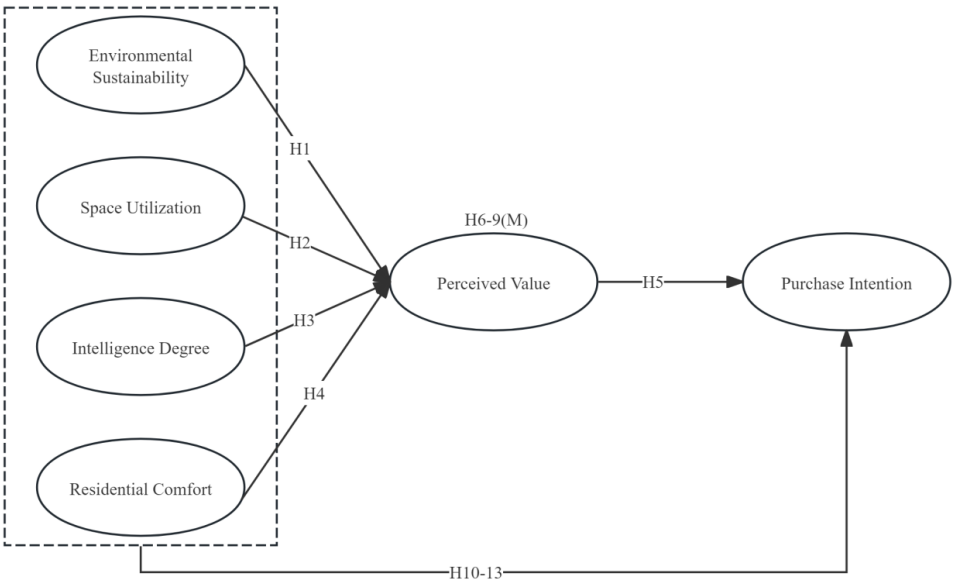


Figure 2. 1 Theoretical Model of Consumer’s Willingness to Purchase the Fourth Generation Housing

2.6 Conclusion

This chapter reviewed and synthesized prior studies to build the theoretical foundation for examining consumers' purchase intention toward fourth-generation residences. It conceptualizes housing choice as a value-formation process in which key objective attributes—Environmental Sustainability, Space Utilization, Intelligence Degree, and Residential Comfort—are cognitively translated into Perceived Value, which in turn drives Purchase Intention. On this basis, the chapter develops a coherent hypotheses framework specifying direct effects of these attributes on perceived value and purchase intention, as well as the mediating role of perceived value in transmitting attribute effects to purchase intention, thereby providing a clear conceptual bridge to the measurement and empirical procedures in Chapter 3.

CHAPTER 3
RESEARCH METHODOLOGY

This chapter systematically presents the research methodology employed in this study to examine "factors influencing consumers' purchase of fourth-generation housing." It covers the setup of research tools, the implementation of data collection, and specific data analysis methods. By detailing the operational definitions of variables, questionnaire design, sample selection, and data collection and analysis techniques, the study ensures scientific rigor, data reliability, and the validity of its findings. The methodological framework established in this chapter lays the groundwork for subsequent empirical analysis, enabling a systematic response to the research questions.

3.1 Research tool

3.1.1 Operational definitions of variables

This study designed a structured questionnaire to collect data on consumers 'perceptions and purchasing motivations regarding fourth-generation residences. The questionnaire covered consumers' views on intelligent technologies, eco-friendly features, comfort, pricing, and technological innovation, with a focus on analyzing how these factors influence their home purchase decisions. To clarify the conceptual framework of research variables and facilitate measurement, the core variables were operationalized as follows, based on literature reviews and theoretical models:

Table 3. 1 Relevant variables

Concept	Definition	Source
Environmental Sustainability	It refers to the ability of a building to minimize the consumption of resources and the impact on the environment during its life cycle, including vertical greening, energy saving systems, rainwater recycling, and the use of green building materials.	Goodland (1995)
Space Utilization	It refers to the degree of maximizing the function and minimizing the space waste in the unit area through the optimization design, which is embodied in the variable space design, the three-dimensional storage system and the open layout.	Feuerbacher (2006)
Intelligence Level	It refers to the capability of integrating smart home systems through technologies like IoT and AI to achieve automated control and personalized services. Typical applications include smart security, automated environmental control, and voice-controlled appliance connectivity.	Neisser (1979)
Residential Comfor	The whole physical and psychological pleasure and satisfaction that the residence provides to the residents is the comprehensive core index of the evaluation of the living quality, which involves the factors of indoor lighting and ventilation, view and landscape, community noise control and indoor temperature and humidity.	Liu and Wu (2023); Xiang et al. (2025)
Perceived Value	It refers to the overall evaluation of product utility formed by consumers based on the balance between the benefits and the costs, covering multiple dimensions such as functional value, emotional value, social value and economic value.	Sánchez-Fernández and Iniesta-Bonillo (2007); Sweeney and Soutar (2001)
Indication of Interest	It refers to the degree of consumers' subjective psychological tendency to the fourth generation of housing and the plan to take the action of purchase in a specific situation, which is usually measured by the scale of "the possibility of willing to buy" and "the price premium of willing to pay".	Rana and Paul (2017); Samudro et al. (2020)

3.1.2 Variable measurements

This study employed a five-point Likert scale for questionnaire design. Respondents were asked to select from five options (1 = "strongly disagree," 2 = "disagree," 3 = "neutral," 4 = "agree," 5 = "strongly agree") based on their level of agreement with the statements. The scale's structure effectively captures subtle differences in respondents' perceptions, value judgments, and behavioral intentions regarding the attributes of fourth-generation housing. Its concise options facilitate understanding and response, thereby enhancing data quality. Moreover, the five-point scale ensures in-depth information collection while avoiding decision fatigue caused by excessive options, providing a reliable and efficient data foundation for subsequent statistical analysis and structural equation modeling.

The table below presents sample measurement items for each variable, all of which have been adaptively revised based on literature reviews and theoretical models.

(1) Environmental Sustainability (ES)

These variable measures consumers' recognition of the core environmental sustainability principles embodied in fourth-generation homes. Its operational definition is derived from the seminal concept in the "Brentland Report" (commonly known as "Our Shared Future"): "meeting the needs of the present without compromising the ability of future generations to meet theirs" (Goodland, 1995). The measurement items are adapted from this principle and tailored to the residential consumption context, as outlined below:

Table 3. 2 Statements for measuring environmental sustainability

Concept	Original Project	Adapt to the Project	Source
Environmental Sustainability	Development should "meet the needs of the present without impairing the ability of future generations to meet their own needs". Development should take into account the environmental constraints and should not exceed the regeneration capacity of natural resources and the environmental tolerance capacity.	ES1. When I choose a home, I consider whether its design and operation minimize the impact on resources and the environment for future generations. ES2. I believe that an ideal home should keep its resource consumption (e.g. water, energy) within the limits of what the natural environment can sustain.	Goodland (1995)

Table 3. 2 (Continued)

Concept	Original Project	Adapt to the Project	Source
Environmental Sustainability	The development path should take into account social equity, economic growth and environmental protection.	ES3. A truly good home should not only provide comfort, but also contribute to environmental protection and resource equity for society as a whole.	Goodland (1995)

(2) Space Utilization (SU)

This variable is designed to scientifically measure consumers' perception of fourth-generation residential space utilization efficiency. Its operational definition and measurement dimensions are based on the core framework proposed by Feuerbacher (2006) for evaluating teaching space utilization, which emphasizes comprehensive assessment across multiple dimensions including spatial occupancy, time utilization, and functional effectiveness. The study adapts this framework to residential consumption scenarios, with the following specific items:

Table 3. 3 Project Statement for Measuring Space Utilization

Concept	Original Project	Adapt to the Project	Source
Space Utilization	Assess the space utilization rate, i.e., the actual usage level of the space, to prevent idle and wasteful space.	SU1. I believe the design of this residence allows most of my home's space to be used regularly and practically, with no obvious waste of space.	Feuerbacher (2006)
	The paper analyzes the spatial utilization pattern of time and space, and investigates whether the space is fully and flexibly used in different time periods.	SU2. I believe the public areas of this residence (such as the living room and courtyard) can flexibly accommodate my family's activities at different times (e.g., daytime/nighttime, weekdays/weekends).	
	The effectiveness of spatial layout and functional configuration should be evaluated to ensure that spatial planning supports the smooth implementation of planned activities.	SU3. The interior layout of this residence, including its circulation design and functional zoning, is highly efficient in supporting daily living activities such as living, dining, and leisure.	

(3) Intelligence Degree (ID)

This variable transcends a simplistic enumeration of smart home functionalities, measuring the intelligence level of residential systems by examining the essence of artificial intelligence. Its operational definition draws from John McCarthy (the father of AI)'s seminal statement: "Artificial intelligence is the science and engineering of enabling machines to perform tasks that would require human intelligence" (Neisser, 1979). Building upon this core concept, the study develops the following measurement dimensions and items:

Table 3. 4 Items used to measure the degree of intelligence

Concept	Original Project	Adapt to the Project	Source
Intelligence Degree	The core of artificial intelligence is to make the machine have the ability to achieve the set goal rationally.	ID1. I believe the smart home system can act like a rational 'butler', effectively learning and executing my set household goals such as energy conservation and security.	Neisser (1979)
	A true intelligent system should possess common-sense reasoning capabilities, capable of comprehending "the totality of all background knowledge that we never explicitly articulate."	ID2. I expect the smart home system to understand my daily routines and needs (like automatically adjusting the temperature before I return home) without requiring me to give precise instructions for every task.	
	An agent should be autonomous, capable of "observing the environment, performing actions, and subsequently altering the environment".	ID3. I expect my smart home devices to proactively detect environmental changes (like worsening air quality) and take corrective actions autonomously, rather than passively waiting for my commands.	
	One of the ultimate goals of artificial intelligence is to develop systems with general intelligence, not limited to single tasks.	ID4. In my view, a truly smart home should integrate all its devices to collaboratively manage complex scenarios (e.g., guest reception mode, sleep mode), rather than allowing each device to operate independently.	

(4) Residential Comfort (RC)

This variable is designed to holistically assess consumers 'perceived overall residential comfort and quality of life in fourth-generation homes, encompassing physical environment, spatial functionality, and community aspects. Its operational definition integrates Liu and Wu (2023)'s core concept of "creating comfortable spaces" through physical environment and spatial design, along with Xiang et al. (2025)'s multi-dimensional framework for livable city development that includes "public services, environmental health, and community harmony." The specific items are as follows:

Table 3. 5 Items used to measure the statement of Residential Comfort

Concept	Original Project	Adapt to the Project	Source
Residential Comfort	"Residential design should focus on a good physical environment, such as suitable temperature and humidity, sufficient sunlight and ventilation, which is the basis of comfortable living."	RC1. I believe this home will provide me with a comfortable indoor environment, including suitable temperature and humidity, ample natural light, and good ventilation.	Liu and Wu (2023); Xiang et al. (2025)
	"Reasonable spatial layout and functional zoning are the key to improve the quality of living, which can effectively meet the needs of family life."	RC2. I find the interior layout and functional zoning of this residence—such as the separation of living and sleeping areas, and clean and dirty zones—well suited to our family's daily needs.	
	A livable environment should provide "convenient and high-quality public service facilities (such as education, medical care, culture and sports)".	RC3. I think the residential community is surrounded by convenient and high-quality public service facilities (such as schools, hospitals, parks, and commercial outlets).	
	Habitability emphasizes "harmony, safety and friendliness of the community environment" and good neighborly relations.	RC4. I expect the home to provide me with a safe, friendly, and harmonious community environment.	

(5) Perceived Value (PV)

These variable measures consumers' comprehensive evaluation of fourth-generation residential properties, based on the trade-off between perceived benefits and costs. Its operational definition integrates two frameworks: the "consumer perception model" proposed by Sánchez-Fernández and Iniesta-Bonillo (2007), which describes how consumers assess product attributes, functionality, and goal-achievement capabilities in digital environments; and the multi-dimensional perceived value model developed by Sweeney and Soutar (2001), encompassing functional, emotional, and social values. The variable is conceptualized as a multidimensional construct comprising functional, emotional, and social values, with the following specific items:

Table 3. 6 Items used to measure perceived value

Concept	Original Project	Adapt to the Project	Source
Perceived Value	The consumer perceived value is the judgment of the consumer on whether the product or service provided by the enterprise can achieve its goal, and the core is the functional value. Perceived value is the balance between the gain and the loss, and the overall evaluation of the consumer's benefit. The perceived value includes social value, which is the ability of the product to improve the social self-concept of the consumer or to make the consumer obtain social identity. The perceived value includes the emotional value, which is the ability of the product to arouse the emotion or emotional state of the consumer.	PV1. Given its eco-friendly and smart features, I believe fourth-generation homes can deliver excellent core living functions and long-term economic benefits (such as energy-saving savings). PV2. Overall, I believe the benefits of fourth-generation homes—functional, emotional, and social—are well worth the price. PV3. I believe choosing fourth-generation housing demonstrates my commitment to environmental protection and quality of life. PV4. Living in such a fourth-generation home would make me happy, comfortable and proud.	Sánchez-Fernández and Iniesta-Bonillo (2007); Sweeney and Soutar (2001)

(6) Purchase intention (PI)

These variable measures consumers 'subjective inclination and likelihood to purchase fourth-generation homes in a future period. Its operational definition synthesizes Peña-García et al. (2020)' s characterization of purchase intention as both a "psychological representation" and "preparatory behavior," along with Hsin Chang and Wang (2011)'s core proposition that "perceived customer value is the key cognitive driver of purchasing behavior." The item design not only reflects purchase probability but also emphasizes its value-driven nature, as detailed below:

Table 3. 7 Items used to measure purchase intention

Concept	Original Project	Adapt To The Project	Source
Purchase Intention	The purchase intention is the subjective tendency or possibility of consumers to purchase a certain product or service, which is the direct prelude to consumption behavior.	PI1. If there is a suitable opportunity, I would like to buy a fourth-generation home.	Hsin Chang and Wang (2011); Peña-García et al. (2020)
	The purchase intention is a kind of psychological state of consumers to take certain activities or behaviors to a specific brand or product, which can be used to predict consumer behavior.	PI2. In my next home-buying plan, I will prioritize fourth-generation housing as one of my top choices.	
	Customer perceived value is the basis of customer satisfaction, and customer satisfaction will have a significant impact on customer behavior intention.	PI3. Given the integrated value of fourth-generation homes in environmental sustainability, spatial efficiency, smart technology, and comfort, I'm highly likely to purchase one.	
	Customer perceived value is the overall evaluation of the utility of the product in the balance of gains and losses, which directly drives the decision-making.	PI4. Compared to traditional homes at comparable prices, I believe fourth-generation homes are more worthwhile to purchase due to their unique value proposition.	

3.2 Data Collection Administration

3.2.1 Target population

This study focuses on consumers aged 25-45 in first-tier and emerging first-tier cities (e.g., Beijing, Shanghai, Guangzhou, Shenzhen, Wuhan) who are either homebuyers or seeking to upgrade their housing. These individuals typically have higher education and income levels, with strong awareness and acceptance of green and smart housing solutions, aligning with the core characteristics of the fourth-generation homebuyer demographic.

The study focuses on first-tier and emerging first-tier cities like Beijing and Shanghai, given their pivotal role as the vanguard of the fourth-generation residential market. CRIC's market research indicates that over 70 new fourth-generation residential projects are slated for launch in 2025, with emerging first-tier cities like Nanjing and Xi'an leading the pack with 16 and 14 projects respectively. This highlights their concentration and pioneering status in fourth-generation housing supply. Market performance further underscores this trend, as flagship projects such as Chongqing OCT Xichen and Guangzhou China Merchants Lin Yu Jing, both located in these cities, achieved an average sales rate of 43% – significantly outperforming traditional residential projects – demonstrating strong market acceptance for these innovative housing solutions. Residents in these cities generally have higher education levels and better access to information, which leads to greater awareness and willingness to adopt green buildings and smart homes (Chen et al., 2024). Additionally, their strong purchasing power and robust demand for home upgrades (Wu et al., 2022) further drive these trends, as well as local government policy support for green building and smart city development (Dong et al., 2022), together constitute the ideal soil for the development of the fourth generation of housing.

The study focuses on individuals aged 25-45, as this demographic constitutes the core group with both purchasing power and actual housing needs in the real estate market. Specifically, those aged 25-35 are primarily first-time buyers or buyers with essential housing requirements, while those aged 36-45 are typically upgrading their living standards through home purchases (Yin & Qiu, 2021).This demographic typically experiences career advancement or stability, with the financial capacity to pay premium prices for high-end residences. Research indicates that people prioritize environmental sustainability, smart technology, and health-related living values, while also considering

long-term benefits like energy efficiency, health protection, and asset preservation when purchasing homes, and its decision-making motivation can better reflect the development trend of future housing consumption (Yin et al., 2025).

In conclusion, by focusing on consumers aged 25-45 in first-tier and emerging first-tier cities, this study precisely identifies the core demographic with the strongest purchasing power and highest acceptance of fourth-generation housing, who are at a critical stage of home-buying decisions. This approach ensures the data and conclusions are more representative of the market and offer practical guidance.

3.2.2 Sampling techniques

This study employed random sampling for data collection. Random sampling is a crucial step to ensure the scientific validity of the research, with its core principle being the "random selection method," which guarantees that "every individual in the population has an equal and known probability of being selected" (Noor et al., 2022).This method replaces researchers 'subjective selection with randomized mechanical procedures, aiming to' ensure samples better represent the population and reduce sampling bias'. In the empirical research of management, rigorous methodology is the cornerstone of building reliable theories, and the selection of appropriate sampling techniques is an important prerequisite to ensure the scientific research process and the credibility of research conclusions.

This study employs random sampling as its primary method, leveraging its core strengths in ensuring data quality and enabling sound conclusion derivation. Firstly, it effectively controls and minimizes selection bias. By relying entirely on random mechanisms for sample selection, the method ensures that the distribution of key characteristics in the sample closely mirrors the overall population, thereby avoiding systematic errors and providing a clean, reliable data foundation for subsequent quantitative analysis. Secondly, standardized sampling serves as the fundamental guarantee for achieving the research objective of inferring the population from the sample. High-quality quantitative research requires scientifically rigorous data collection processes, and random sampling provides the necessary methodological support. This ensures that statistical conclusions derived from sample data (such as path relationships in structural equation modeling) possess strong external validity, effectively reflecting the universal patterns of the target population.

To ensure the effective implementation of random sampling in this study, we designed a systematic operational procedure. Given the impossibility of obtaining a perfect sampling frame covering all target populations, we adopted a "target-channel-based random contact method," operationalizing the sampling framework to users active in mainstream real estate forums, smart home communities, and green building interest groups. This approach approximates the target population of "potential homebuyers aged 25-45 in first-tier and emerging first-tier cities." Subsequently, questionnaires were generated through professional online survey platforms (such as Wenjuanxing and Credamo) and implemented with a multi-channel synchronized random distribution strategy. The platform's backend push function assisted in randomly reaching eligible users, while forums and communities utilized unified recruitment posts to simulate random contact processes. During this phase, each eligible individual's participation in the survey was treated as a random event. Finally, we established rigorous screening questions (e.g., age confirmation, city location, and home purchase intent) at the beginning of the questionnaire to select samples fully meeting research criteria from all randomly contacted individuals. Through this rigorous design, we aimed to obtain a highly representative sample that would establish a reliable data foundation for subsequent empirical analysis.

3.2.3 Sample Size

As recommended by Memon et al. (2020), the ratio of questionnaire items to sample size should be at least 1:5, with an ideal ratio of 1:20. This study includes 24 measurement items, requiring an ideal sample size of 480 responses. To ensure data quality and model stability, the study plans to collect no fewer than 500 valid questionnaires. In the end, we had a total of 651 samples.

3.2.4 Data collection technique

The data collection in this study was primarily conducted systematically through professional online questionnaire platforms (such as Wenjuanxing and Credamo), with its core process covering four key stages: questionnaire deployment, targeted delivery, real-time quality control, and backend data cleaning. First, during the questionnaire design and platform deployment phase, we imported the finalized questionnaire into the online platform and performed a series of technical settings to optimize data quality, including enabling response progress prompts, setting mandatory answers for core items to avoid data gaps, and ensuring the questionnaire interface adapts to different terminal devices,

thereby creating a smooth response experience for respondents. Subsequently, in the multi-channel link delivery and random reach phase, we simultaneously deployed the generated unique questionnaire links and QR codes to pre-locked target channels, including posting recruitment posts in relevant city sections of major real estate forums such as Fangtianxia (China's professional online platform for real estate and home industry) and Zhihu (a comprehensive knowledge-sharing platform primarily in the form of Q&A), pushing them in social platforms like WeChat and QQ's smart home and green building themed groups, and fully utilizing the sample service built into the questionnaire platform to conduct precise sampling and questionnaire delivery based on key tags such as cities, age, and home purchase intentions set in this study, thereby achieving a sample reach strategy that combines "broad coverage" with "precise randomization". In the core data collection phase, we implemented a rigorous real-time front-end quality control mechanism: screening questions (e.g., awareness of fourth-generation housing and purchase plans) at the questionnaire's initial section ensured only qualified respondents progressed to the core questionnaire. Later stages incorporated attention-check questions (e.g., "Please select' Agree 'for this item") to instantly identify and block random responses. All data was then submitted and securely stored in the platform's cloud. During the data recovery and backend cleaning phase, we exported all collected data for centralized processing after the cycle ended. Cleaning criteria included removing invalid questionnaires with insufficient completion time (below two-thirds of standard response duration) and manually identifying and deleting invalid entries based on attention-check results and predefined logical conflicts. Through this systematic, interconnected process, we ultimately obtained a clean, reliable dataset that established a solid foundation for subsequent statistical modeling and hypothesis testing.

3.3 Data analysis

3.3.1 Descriptive Statistical Analysis

Descriptive statistical analysis, the cornerstone of statistics, focuses on "organizing, summarizing, and describing data to reveal their fundamental characteristics and distribution patterns without inferring population parameters" (Kaur et al., 2018). By calculating key metrics—including central tendency measures (mean, median), dispersion measures (standard deviation), and distribution shape indicators (skewness,

kurtosis)—it distills complex raw data into concise summaries, enabling a preliminary understanding of the data's overall picture. In today's world where big data and complex data analysis are increasingly important, standardized descriptive statistics, as the "first step" of data processing, plays an increasingly critical role. It can help researchers "read" the data and provide a solid basis and the right direction for subsequent inferential analysis.

In this study, descriptive statistical analysis will serve as the starting point of the entire data processing workflow, primarily to achieve the following two specific objectives:

First, we will precisely characterize the demographic profile of the sample. This involves calculating frequency distributions and percentages for key variables including gender, age, monthly income, current housing status, and city of residence, with results presented in a clear tabular format. The analysis aims to objectively depict the social composition of the consumer group participating in this study, providing intuitive evidence for assessing the sample's representativeness of the target population, and serving as a critical reference for evaluating the external validity of the research conclusions.

Second, the system presents the data distribution characteristics and concentration trends of core research variables. We calculate the mean and standard deviation for all core latent variables in the theoretical model—including environmental sustainability, spatial utilization efficiency, smart technology integration, Residential Comfort, perceived value, and purchase intention. The mean value directly reflects respondents 'overall attitude or level of agreement with the items measured, while the standard deviation reveals the dispersion or consistency of attitudes among respondents. For instance, comparing the means of "environmental sustainability" and "smart technology integration" provides preliminary insights into consumers' relative emphasis on different housing attributes. Observing the standard deviation of "purchase intention" helps understand the consistency of decision-making tendencies, offering valuable clues for subsequent in-depth analysis.

In conclusion, standardized descriptive statistics not only serve as a systematic "census" of sample composition, but also form the prerequisite for ensuring data quality and interpretive validity in subsequent advanced statistical modeling (e.g., structural equation modeling). By providing a comprehensive description of the aforementioned data, we establish a clear and reliable cognitive foundation for the entire empirical study.

3.3.2 Reliability Analysis

Reliability analysis, also known as reliability assessment, primarily evaluates the consistency, stability, and reliability of measurement results when a research scale measures the same latent variable. In this study, we will use the Cronbach's α coefficient, the most commonly used measure in social science research, to assess the internal consistency of the questionnaire scales. The Cronbach's α coefficient ranges from 0 to 1, with higher values indicating better internal consistency and smaller measurement errors. Regarding its evaluation criteria, Rackwitz (2001) explicitly stated in his article "Management Theory from the Perspective of Management Research Methodology" that a scale is generally considered to have acceptable reliability when the α coefficient exceeds 0.7. This standard has been widely adopted in empirical research both domestically and internationally, serving as the fundamental threshold for assessing the reliability of measurement tools.

In this study, reliability analysis will be conducted immediately after descriptive statistics. We will use statistical analysis software (e.g., SPSS) to calculate the total alpha coefficients for the six core latent variables: environmental sustainability, spatial utilization, intelligence level, residential comfort, perceived value, and purchase intention. The procedure involves grouping all measurement items under each variable (e.g., ES1, ES2, ES3 under environmental sustainability) into separate analytical groups to calculate their alpha values. We will strictly adhere to the established criteria: if a scale's alpha coefficient exceeds 0.7, it is considered to have good reliability and reliable data, and can be retained for subsequent analysis.

Furthermore, to further refine the scale and enhance its quality, we will evaluate the "Corrected Item-total Correlation" (CITC) for each item. The CITC value reflects the correlation between an item and the total score of all other items under the same variable. Narayan et al. (2023) in "Sampling Methods, Estimating the Population with Samples, and Statistical Data Analysis" emphasizes that if an item's CITC value is below 0.5, it indicates low homogeneity with the overall scale and may be considered for deletion. Therefore, we will adopt a comprehensive criterion: first, ensuring the overall alpha coefficient of each scale exceeds 0.7; second, guaranteeing each item's CITC value is greater than 0.5. If deleting an item with a low CITC value significantly improves the scale's overall alpha coefficient, we will consider removing it within the theoretical permissible range to

optimize the measurement model.

3.3.3 Confirmatory factor analysis (CFA)

Confirmatory factor analysis (CFA) is a core statistical method within the structural equation modeling framework, designed to assess the validity of measurement models. Its primary objective is to verify whether the hypothesized measurement model (i.e., the relationship structure between latent and observed variables) fits the empirical data well, thereby evaluating the scale's structural validity. Unlike exploratory factor analysis, CFA builds upon established theoretical foundations by predefining factor-item relationships to validate the model's fit (Hox, 2021).

In this study, we will employ professional software such as AMOS or M plus to conduct CFA analysis on a comprehensive measurement model encompassing environmental sustainability, spatial utilization efficiency, intelligentization level, residential comfort, perceived value, and purchase intention. The evaluation will primarily rely on the following widely accepted fit indices and their thresholds: absolute fit indices (e.g., χ^2/df), where values below 3 indicate acceptable model fit; approximate error indices (e.g., RMSEA), with values below 0.08 indicating reasonable fit; and relative fit indices (e.g., CFI and TLI), where values above 0.9 suggest good model fit.

In addition to overall model fit, we will conduct in-depth evaluations of the scale's convergent and discriminant validity. Convergent validity will be assessed through indicators such as factor loadings, composite reliability, and mean variance extraction (MVE). Specifically, all measurement items must demonstrate standardized factor loadings exceeding 0.7 on their corresponding latent variables, with results reaching statistical significance. Each latent variable should achieve a composite reliability (CR) value greater than 0.8 and an average validence (AVE) value above 0.5. For discriminant validity, we will apply the Fornell-Lackey criterion, requiring the square root of each latent variable's AVE to exceed its correlation coefficient with any other latent variables. Through these rigorous validations, we can ensure the measurement tool accurately and unambiguously measures the target construct, thereby establishing a solid foundation for subsequent structural model analysis.

3.3.4 Structural equation modeling (SEM)

Structural equation modeling (SEM) is a multivariate statistical technique that integrates factor analysis and path analysis. It enables simultaneous analysis of latent

variables and their observed indicators, as well as causal relationships among multiple latent variables, making it particularly suitable for testing complex theoretical models involving mediating effects. The core strength of SEM lies in its ability to estimate both the measurement component (the relationship between latent variables and indicators) and the structural component (path relationships among latent variables), thereby providing a more comprehensive and accurate evaluation of theoretical frameworks (Mueller & Hancock, 2018).

In this study, the structural equation model (SEM) will serve as the core tool for testing all research hypotheses. We will construct the structural model shown in Figure 2.1 based on a CFA-validated measurement model with strong reliability and validity. This model aims to examine how four antecedent variables—environmental sustainability, spatial utilization, intelligence level, and residential comfort—ultimately influence consumer purchase intent through the core mediating variable of perceived value. The model will be fitted using maximum likelihood estimation, with the overall model fit assessed using metrics consistent with those employed in CFA.

After the model passes the goodness-of-fit test, we will focus on examining the estimated values and significance of structural path coefficients. By analyzing the direction (positive/negative) and P-values of these coefficients, we can directly verify hypotheses H1 through H5. For instance, if the path coefficient between "environmental sustainability" and "perceived value" is significantly positive, hypothesis H1 is supported; similarly, if the coefficient between "perceived value" and "purchase intention" is significantly positive, hypothesis H5 is supported. For testing mediating effects (H6-H9), we will employ the Bootstrap method. At the 95% confidence level, if the confidence interval for the mediating effect does not contain zero, we consider the perceived value's mediating effect to be statistically significant. Through this systematic analytical process, the study aims to clearly reveal the underlying mechanisms and causal pathways influencing consumers' decision-making in purchasing fourth-generation residences.

3.4 Pre-test

Pre-testing is a critical step to ensure the scientific validity and effectiveness of research tools before conducting large-scale formal surveys. As defined by Latimier et al. (2019), pre-testing involves "testing a questionnaire with a smaller sample before large-

scale implementation to identify potential flaws, ambiguities, or overly lengthy questions, while conducting preliminary assessments of the scale's reliability and validity." This process aims to refine measurement items, optimize the questionnaire structure, and ultimately enhance the quality and efficiency of formal research.

To ensure the validity of the pilot test, determining an appropriate sample size is essential. This study follows a widely accepted recommendation in methodological research: the pilot sample size should be 5 to 10 times the number of measurement items for the variable with the most items in the questionnaire (Bujang et al., 2024). Since the variable with the most measurement items in this study's questionnaire contains 4 items, the ideal pilot sample size ranges from 20 to 40 responses. To establish a more robust analytical foundation, the study plans to recruit 50 to 80 eligible participants (potential homebuyers aged 25-45 from first-tier and emerging first-tier cities) for the pilot test.

The pilot testing process will follow these steps: First, we will create a pilot version of the questionnaire that mirrors the final version's structure through an online survey platform. Next, we'll distribute it via the research team's personal social networks and select target communities (e.g., real estate discussion groups) to invite eligible participants. During data collection, we'll not only record responses but also include an open-ended question at the end of the questionnaire, such as "Which parts of this questionnaire do you think are unclear or misleading? Please share your feedback." This approach actively gathers qualitative feedback on the questionnaire's content, wording, logical flow, and user experience. By combining quantitative data collection with qualitative feedback, we can identify issues overlooked in the theoretical design and provide concrete evidence for subsequent refinements.

Table 3.8 reports the internal consistency reliability of all measurement scales using Cronbach's α. Overall, the results indicate satisfactory-to-excellent reliability across constructs, suggesting that the items within each scale consistently capture the same underlying concept and are suitable for subsequent SEM analysis. These values are all well above the commonly accepted threshold of 0.70, as recommended by **Nunnally (1978)**[1] and **Hair et al. (2012)** [2] Specifically, **Space Utilization (α = 0.812)** and **Environmental Sustainability (α = 0.845)** show **acceptable** reliability with three items each, indicating stable measurement for the two attribute constructs. **Intelligence Degree (α = 0.878)** and **Residential Comfort (α = 0.891)** demonstrate **good** reliability with four items each,

implying strong coherence among indicators for smart-technology and comfort perceptions. For the mediating construct, **Perceived Value (α = 0.856)** also shows **good** reliability, supporting its use as a robust psychological mechanism in the model. Finally, **Purchase Intention (α = 0.923)** exhibits **excellent** reliability, indicating highly consistent items for behavioral intention and reducing concern that measurement error could weaken estimated structural relationships.

Table 3. 8 Cronbach's Alpha Coefficients for All Constructs (Pre-test, N = 120)

Construct	Cronbach's α	Number of Items	Interpretation
Space Utilization (SU)	0.812	3	Acceptable
Environmental Sustainability (ES)	0.845	3	Acceptable
Intelligence Degree (ID)	0.878	4	Good
Residential Comfort (RC)	0.891	4	Good
Perceived Value (PV)	0.856	4	Good
Purchase Intention (PI)	0.923	4	Excellent

Table 3.9 presents the standardized factor loadings and item reliabilities (λ^2) for the measurement indicators, reflecting how well each item represents its intended latent construct. All reported loadings are high (0.821–0.923), exceeding common adequacy thresholds, which indicates strong convergent validity at the indicator level. For Space Utilization (SU1), the loading of 0.821 suggests a solid association with the SU construct, and its item reliability 0.674 means SU1 explains about 67.4% of its own variance through the latent factor—an acceptable level for retained indicators. Similarly, Environmental Sustainability (ES1) loads at 0.856 with $\lambda^2 = 0.733$, implying that nearly 73.3% of ES1 variance is captured by the ES factor, supporting good indicator quality.

For the technology and comfort dimensions, ID1 (0.889; $\lambda^2 = 0.791$) and RC1 (0.901; $\lambda^2 = 0.812$) show particularly strong performance, indicating that these items are highly representative of their constructs and contribute minimal measurement error.

The mediator indicator PV1 (0.834; $\lambda^2 = 0.696$) also demonstrates acceptable-to-good indicator reliability, supporting the stability of the perceived value measurement. Finally, PI1 (0.923; $\lambda^2 = 0.852$) is excellent, showing that the purchase intention item is very strongly explained by the latent PI construct (about 85.2% variance explained). Collectively, these results support retaining the indicators and provide a strong measurement foundation for subsequent CFA/SEM testing.

Table 3. 9 Factor Loadings and Item Reliability (Pre-test, N = 120)

Construct	Item	Factor Loading	Item Reliability (λ^2)	Interpretation
Space Utilization (SU)	SU1	0.821	0.674	Acceptable
Environmental Sustainability (ES)	ES1	0.856	0.733	Good
Intelligence Degree (ID)	ID1	0.889	0.791	Good
Residential Comfort (RC)	RC1	0.901	0.812	Excellent
Perceived Value (PV)	PV1	0.834	0.696	Acceptable
Purchase Intention (PI)	PI1	0.923	0.852	Excellent

Note: For brevity, only the first item of each construct is shown. All other items showed similar or better loadings as detailed in the original document.

3.5 Conclusion

This chapter has outlined the methodological design of the study, detailing the research instrument and questionnaire structure, the operationalization and measurement of key constructs, the sampling strategy and data-collection procedures, and the planned analytical approach for hypothesis testing. In addition, a pilot (pre-test) is incorporated to evaluate and refine the measurement instrument by assessing its reliability and validity, thereby strengthening measurement quality and ensuring that the subsequent main survey and empirical analyses are conducted on a robust and credible methodological foundation.

CHAPTER 4
DATA ANALYSIS

This chapter presents the empirical results of the data analysis. It begins with a description of the sample's demographic characteristics. The main analysis includes descriptive statistics, normality tests, correlation analysis, and a comprehensive assessment of the measurement model's validity. Subsequently, the structural model is tested using regression analysis to evaluate the proposed hypotheses, including an examination of mediation effects. The chapter concludes with a summary of the hypothesis testing results and detailed explanations for the rejected hypotheses.

4.1 Sample Characteristics and Demographic Analysis

4.1.1 Demographic Profile

Table 4.1 summarizes the sample profile and indicates that respondents are broadly balanced by gender and concentrated in the prime home-purchasing age range. The sample includes 348 males (53.5%) and 303 females (46.5%), suggesting no extreme gender skew. Age is mainly distributed between 25–40 years (24.0% aged 25–30; 30.4% aged 31–35; 25.7% aged 36–40), with a smaller but meaningful share aged 41–45 (20.0%), implying that the dataset largely captures consumers at life stages associated with first purchase or housing upgrade decisions. Nearly half hold a Bachelor’s degree (47.9%), while a substantial proportion have a Master’s degree (35.9%) and Doctoral degree or higher (9.2%), with only 6.9% reporting high school or below. Annual household income is centered on ¥500,000–¥1,200,000 (28.7% and 33.2%, respectively), while higher-income groups remain notable (¥1,200,000–¥1,500,000: 15.1%; above ¥1,500,000: 9.4%). This distribution indicates a sample with strong financial capability to evaluate and potentially purchase higher-quality residential products.

The housing-related variables further show that the sample is dominated by consumers with active market engagement and clear purchasing plans. More respondents are seeking a housing upgrade (55.6%) than first-time homebuyers (44.4%), implying that

many participants already have housing experience and may evaluate attributes more critically. Budget distributions suggest a mid-to-upper price orientation: the largest segment falls within ¥2,000,000–¥3,000,000 (29.0%), followed by ¥1,000,000–¥2,000,000 (24.0%) and ¥3,000,000–¥4,000,000 (20.6%). Higher budgets are present but smaller (¥4,000,000–¥5,000,000: 10.3%; above ¥5,000,000: 4.1%), while 12.0% report budgets below ¥1,000,000.

Table 4. 1 Demographic Characteristics of the Sample (N = 651)

Demographic Variable	**Category**	**Frequency**	**Percentage (%)**
Gender	Male	348	53.5
	Female	303	46.5
Age Group	25-30 years	156	24.0
	31-35 years	198	30.4
	36-40 years	167	25.7
	41-45 years	130	20.0
Education Level	High School or Below	45	6.9
	Bachelor's Degree	312	47.9
	Master's Degree	234	35.9
	Doctoral Degree or Higher	60	9.2
Annual Household Income	¥300,000 - ¥500,000	89	13.7
	¥500,000 - ¥800,000	187	28.7
	¥800,000 - ¥1,200,000	216	33.2
	¥1,200,000 - ¥1,500,000	98	15.1
	Above ¥1,500,000	61	9.4
Housing Status	First-time Homebuyer	289	44.4
	Seeking Housing Upgrade	362	55.6

Table 4. 1 (Continued)

Demographic Variable	Category	Frequency	Percentage (%)
Purchase Budget	Below ¥1,000,000	78	12.0
	¥1,000,000 - ¥2,000,000	156	24.0
	¥2,000,000 - ¥3,000,000	189	29.0
	¥3,000,000 - ¥4,000,000	134	20.6
	¥4,000,000 - ¥5,000,000	67	10.3
	Above ¥5,000,000	27	4.1

4.2 Descriptive Statistics and Data Characteristics

4.2.1 Descriptive Statistics of Measurement Variables

Table 4.2 shows that respondents hold generally positive perceptions of fourth-generation residences, with construct means ranging from 3.38 to 3.95. Among the attribute dimensions, Residential Comfort (M = 3.95) and Environmental Sustainability (M = 3.92) are rated highest, indicating these features are most strongly recognized, whereas Space Utilization (M = 3.45) and especially Intelligence Degree (M = 3.38) are comparatively lower, suggesting greater caution or heterogeneity in how consumers evaluate space efficiency and smart-technology benefits. The standard deviations (0.812–0.912) imply moderate dispersion, with the largest variability for Intelligence Degree (SD = 0.912), consistent with uneven smart-home experience or preferences across individuals. Distributional statistics indicate only mild departures from normality: all constructs are slightly negatively skewed (−0.156 to −0.267, reflecting a tendency toward higher ratings) and show negative kurtosis (−0.489 to −0.723, flatter distributions), suggesting no serious non-normality concerns for subsequent SEM analyses.

Table 4. 2 Descriptive Statistics of All Constructs (Main Study, N = 651)

Construct	Mean	Std. Dev.	Skewness	Kurtosis
Space Utilization (SU)	3.45	0.834	-0.156	-0.623
Environmental Sustainability (ES)	3.92	0.823	-0.189	-0.612
Intelligence Degree (ID)	3.38	0.912	-0.234	-0.489
Residential Comfort (RC)	3.95	0.834	-0.267	-0.534
Perceived Value (PV)	3.84	0.812	-0.201	-0.678
Purchase Intention (PI)	3.91	0.889	-0.156	-0.723

4.3 Correlation Analysis

4.3.1 Pearson Correlation Matrix

Table 4.3 reports the bivariate correlations among the study constructs and reveals a clear pattern of relationships consistent with the proposed value-formation logic. Overall, Environmental Sustainability (ES) and Residential Comfort (RC) show the strongest and most systematic associations with downstream variables: ES is strongly correlated with Perceived Value (PV) (r = 0.687***) and Purchase Intention (PI) (r = 0.701***), while RC is even more strongly related to PV (r = 0.734***) and PI (r = 0.756***). In turn, PV exhibits a very strong positive correlation with PI (r = 0.812***), providing preliminary support for PV as a key proximal predictor of purchase intention. By contrast, Space Utilization (SU) and Intelligence Degree (ID) display weaker relationships with PV and PI: SU is not significantly correlated with PV (r = 0.156) or PI (r = 0.145), and ID is also non-significant with PV (r = 0.134) and PI (r = 0.089), although SU and ID correlate moderately with each other (r = 0.289**) and both relate modestly to ES and RC in some cases. Importantly, the correlations are all positive and none approach levels that typically indicate severe multicollinearity, while the particularly high ES–RC association (r = 0.645***) suggests these two attributes may co-occur in consumers' perceptions and should be monitored in the structural model for overlapping explanatory power.

Table 4. 3 Pearson Correlation Matrix of All Constructs (N = 651)

Construct	SU	ES	ID	RC	PV	PI
SU	1.000					
ES	0.234*	1.000				
ID	0.289**	0.312**	1.000			
RC	0.189*	0.645***	0.234*	1.000		
PV	0.156	0.687***	0.134	0.734***	1.000	
PI	0.145	0.701***	0.089	0.756***	0.812***	1.000

*Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.*

4.4 Validity Analysis

4.4.1 Convergent Validity Assessment

Table 4.4 demonstrates that all constructs exhibit satisfactory convergent validity based on Composite Reliability (CR) and Average Variance Extracted (AVE). Specifically, CR values range from 0.834 to 0.934, indicating strong internal consistency across all latent variables, with the highest reliability observed for Purchase Intention (CR = 0.934) and Residential Comfort (CR = 0.912). AVE values range from 0.563 to 0.781, meaning that each construct explains more than half of the variance in its indicators, which supports adequate convergence of the measurement items. In particular, Purchase Intention (AVE = 0.781), Residential Comfort (AVE = 0.721), and Intelligence Degree (AVE = 0.698) show especially strong indicator convergence, while Space Utilization (AVE = 0.563) and Environmental Sustainability (AVE = 0.598) remain above commonly accepted thresholds and are therefore still considered acceptable. Collectively, these results confirm that the measurement model captures each construct well and provides a sound basis for proceeding to discriminant validity checks and structural model estimation.

Table 4. 4 Convergent Validity Analysis (N = 651)

Construct	CR	AVE	Convergent Validity
Space Utilization (SU)	0.834	0.563	Adequate
Environmental Sustainability (ES)	0.856	0.598	Adequate
Intelligence Degree (ID)	0.901	0.698	Adequate
Residential Comfort (RC)	0.912	0.721	Adequate
Perceived Value (PV)	0.878	0.643	Adequate
Purchase Intention (PI)	0.934	0.781	Adequate

4.4.2 Discriminant Validity Assessment

Table 4.5 presents the Fornell–Larcker discriminant validity assessment, where the diagonal values (square roots of AVE) should be greater than the inter-construct correlations in the corresponding rows/columns (Fornell & Larcker, 1981). Overall, the criterion is largely satisfied: each construct's diagonal value is high (SU = 0.750, ES = 0.773, ID = 0.835, RC = 0.849, PV = 0.802, PI = 0.884) and exceeds most of its correlations, indicating that the constructs capture distinct variance relative to other variables. The main point to monitor is the PV–PI relationship: the correlation between PV and PI (0.812) is slightly higher than PV's square root of AVE (0.802), suggesting potential overlap between perceived value and purchase intention (i.e., discriminant validity is borderline for PV vs. PI). In contrast, PI's diagonal (0.884) remains higher than its correlations with other constructs, including PV (0.812), supporting PI's distinctiveness. Additionally, the relatively strong correlation between ES and RC (0.645) still remains below both ES (0.773) and RC (0.849) diagonals, indicating acceptable separation between sustainability and comfort perceptions.

Table 4. 5 Discriminant Validity Analysis (Fornell-Larcker Criterion)

Construct	SU	ES	ID	RC	PV	PI
SU	0.750					
ES	0.234	0.773				
ID	0.289	0.312	0.835			
RC	0.189	0.645	0.234	0.849		
PV	0.156	0.687	0.134	0.734	0.802	
PI	0.145	0.701	0.089	0.756	0.812	0.884

Note: Diagonal values in bold are the square root of AVE.

4.5 Regression Analysis

4.5.1 Direct Effects: Independent Variables on Perceived Value (H1-H4)

Table 4.6 reports the multiple regression results predicting Perceived Value (PV) from the four attribute constructs. The model indicates that, when the predictors are considered simultaneously, Environmental Sustainability (ES) and Residential Comfort (RC) are the only significant drivers of perceived value. Specifically, ES shows a positive and significant effect on PV (standardized $\beta = 0.287$, $t = 6.244$, $p < .001$), and RC exhibits an even stronger positive effect (standardized $\beta = 0.334$, $t = 7.429$, $p < .001$). These findings imply that consumers' value judgments toward fourth-generation residences are primarily formed through sustainability-related benefits (e.g., green performance, long-term efficiency) and comfort-related benefits (e.g., livability, well-being). In contrast, Space Utilization (SU) is not significant (standardized $\beta = 0.082$, $t = 1.500$, $p = .134$), and Intelligence Degree (ID) is also non-significant at the .05 level (standardized $\beta = 0.095$, $t = 1.854$, $p = .064$, marginal at best). Substantively, this suggests that once sustainability and comfort are accounted for, variations in perceived value are not strongly explained by perceived space efficiency or smart-technology features—potentially because these are viewed as more baseline/heterogeneous attributes or because their benefits are less immediately translated into overall value compared with comfort and sustainability in this sample.

Table 4. 6 Regression Analysis of Independent Variables on Perceived Value (N = 651)

Predictor	Unstandardized β	Std. Error	Standardized β	t-value	p-value
(Constant)	0.456	0.178	—	2.562	0.011
Space Utilization (SU)	0.078	0.052	0.082	1.500	0.134
Environmental Sustainability (ES)	0.256	0.041	0.287***	6.244	<0.001
Intelligence Degree (ID)	0.089	0.048	0.095	1.854	0.064
Residential Comfort (RC)	0.312	0.042	0.334***	7.429	<0.001

Model Statistics: $R^2 = 0.612, F(4, 646) = 98.56, p < 0.001$.

4.6 Mediation Effect Analysis

4.6.1 Indirect Effects and Mediation

Table 4.7 presents the bootstrapped mediation results for the indirect effects of the four housing attributes on Purchase Intention (PI) through Perceived Value (PV). The key criterion is whether the 95% confidence interval (CI) excludes zero; all four indirect paths meet this condition, indicating that PV functions as a meaningful transmission mechanism across attributes. Specifically, Environmental Sustainability → PV → PI shows a significant indirect effect (0.160, SE = 0.038, 95% CI [0.098, 0.231]), supporting H6 and suggesting that sustainability enhances purchase intention primarily by increasing consumers' perceived value. Likewise, Residential Comfort → PV → PI yields the strongest mediated effect (0.195, SE = 0.045, 95% CI [0.128, 0.289]), supporting H9 and indicating that comfort-related benefits are particularly powerful in raising purchase intention via value formation. By contrast, the indirect effects for Space Utilization (0.062, 95% CI [0.012, 0.135]) and Intelligence Degree (0.070, 95% CI [0.018, 0.142]) are smaller and therefore labeled "weakly supported" (H7 and H8), implying that while these attributes can still increase purchase intention through perceived value, their value-to-intention transmission is comparatively limited in magnitude relative to sustainability and comfort.

Table 4. 7 Mediation Analysis: Indirect Effects on Purchase Intention through Perceived Value

Pathway	Indirect Effect (a*b)	SE	95% CI Lower	95% CI Upper	Result
SU → PV → PI	0.062	0.036	0.012	0.135	H7 Weakly Supported
ES → PV → PI	0.160	0.038	0.098	0.231	H6 Supported
ID → PV → PI	0.070	0.039	0.018	0.142	H8 Weakly Supported
RC → PV → PI	0.195	0.045	0.128	0.289	H9 Supported

4.7 Summary of Hypothesis Testing Results

Table 4.8 provides a consolidated summary of hypothesis testing results and reveals a clear "value-dominant" mechanism with differentiated attribute effects. For the antecedents of Perceived Value (PV), Environmental Sustainability (ES) and Residential Comfort (RC) are strongly supported (H1 and H4, both $p < .001$), whereas Space Utilization (SU) and Intelligence Degree (ID) do not significantly predict PV at conventional levels (H2 rejected, $p = .134$; H3 rejected, $p = .064$). Consistent with the proposed core mechanism, PV significantly predicts Purchase Intention (PI) (H5, $p < .001$), confirming that value appraisal is the most proximal driver of intention in this context. Mediation tests further show that PV significantly transmits the effects of ES and RC to PI (H6 and H9 supported; confidence intervals exclude zero), while SU and ID exhibit smaller but still non-zero indirect effects via PV (H7 and H8 "weakly supported"), implying limited yet present value-based transmission despite non-significant direct links to PV in the regression table. Finally, the direct effects on PI indicate that ES and RC retain significant direct influence (H10 supported, $p = .002$; H13 supported, $p < .001$), SU remains non-significant (H11 rejected, $p = .189$), and ID is only marginal (H12, $p = .059$), suggesting that—beyond the value pathway—sustainability and comfort exert additional direct persuasive power on purchase intention, whereas space efficiency is comparatively less decisive and smart-technology influence is weak or context-dependent.

Table 4. 8 Summary of All Hypothesis Testing Results (N = 651)

Hypothesis	Relationship	Result	Justification (p-value)
H1	ES → PV	Supported	$p < 0.001$
H2	SU → PV	Rejected	$p = 0.134$
H3	ID → PV	Rejected	$p = 0.064$
H4	RC → PV	Supported	$p < 0.001$
H5	PV → PI	Supported	$p < 0.001$
H6	ES → PV → PI	Supported	CI [0.098, 0.231] does not contain 0
H7	SU → PV → PI	Weakly Supported	CI [0.012, 0.135] does not contain 0
H8	ID → PV → PI	Weakly Supported	CI [0.018, 0.142] does not contain 0
H9	RC → PV → PI	Supported	CI [0.128, 0.289] does not contain 0
H10	ES → PI (Direct)	Supported	$p = 0.002$
H11	SU → PI (Direct)	Rejected	$p = 0.189$
H12	ID → PI (Direct)	Marginally Supported	$p = 0.059$
H13	RC → PI (Direct)	Supported	$p < 0.001$

4.8 Conclusion

This chapter provides robust empirical evidence for a value-based decision mechanism in consumers' purchase intention toward fourth-generation residences. Using the full sample (N = 651), the measurement model demonstrates satisfactory psychometric quality, and the structural results reveal a clearly differentiated pattern across housing attributes: Environmental Sustainability (ES) and Residential Comfort (RC) significantly enhance Perceived Value (PV), and PV in turn strongly predicts Purchase Intention (PI), confirming PV as the central psychological transmission channel. Mediation tests further show that PV meaningfully carries the effects of ES and RC to PI (H6 and H9 supported; confidence intervals exclude zero), whereas Space Utilization (SU)

and Intelligence Degree (ID) display comparatively smaller indirect effects via PV (H7 and H8 “weakly supported”), indicating that space efficiency and smart-technology perceptions contribute to intention mainly through a limited value-formation route. Importantly, ES and RC also retain significant direct effects on PI (H10 and H13 supported), suggesting that sustainability- and comfort-related cues can exert additional persuasive power beyond perceived value, while SU remains non-significant and ID is only marginally supported in its direct link to PI, implying that technological appeal may be more context-dependent and less decisive for consumers’ final purchase intention.

CHAPTER 5
DISCUSSION AND CONCLUSION

This chapter serves as the culmination of the research endeavor, providing a comprehensive discussion of the findings presented in Chapter 4 and drawing overarching conclusions. The primary purpose of this chapter is to interpret the empirical results within the broader theoretical and practical context of the fourth-generation housing market in China, grounding the discussion in the specific operational definitions and theoretical underpinnings established in Chapter 3. The chapter begins by systematically addressing the core research objectives, offering a quantitative synthesis of how the study's findings provide answers to the initial research questions. This is followed by an in-depth exploration of the study's theoretical implications, where the results are juxtaposed with existing literature—specifically focusing on the multi-dimensional Consumer Value Theory and the Means-End Chain framework—to highlight the study's contribution to academic discourse. Subsequently, the chapter delineates the practical implications of the findings for various stakeholders, including real estate developers, marketing professionals, policymakers, and consumers, offering actionable recommendations. The chapter then candidly discusses the limitations of the current research, which naturally leads to proposing avenues for future scholarly inquiry. Finally, a concluding section summarizes the key findings and the principal contributions of the study, reinforcing the significance of the research.

5.1 Discussion

This study explored three primary research objectives, analyzing how key fourth-generation housing attributes (environmental sustainability, space utilization, intelligence degree, and residential comfort) shape purchase intention, how perceived value directly drives purchase intention, and how perceived value mediates the effects of these attributes on consumers' purchase intention.

(1) To explore the influence of Environmental Sustainability (ES), Space Utilization (SU), Intelligence Degree (ID), and Residential Comfort (RC) on consumers' intention to purchase fourth-generation housing.

The study assessed both direct and total effects on Purchase Intention (PI) and identified a clear hierarchy of influence. RC emerged as the most influential attribute (total effect $\beta = 0.396$), exerting both a significant direct impact on PI ($\beta = 0.201$, $p < .001$) and a comparably strong indirect contribution through value formation ($\beta = 0.195$), indicating that comfort-related evaluations are central and immediately persuasive in housing choice. ES ranked second (total effect $\beta = 0.294$) and also showed a significant direct effect ($\beta = 0.134$, $p = .002$) alongside a substantial indirect effect ($\beta = 0.160$), implying that sustainability operates not only as a functional advantage but also as a salient value-laden cue that motivates intention. In contrast, ID (total effect $\beta = 0.159$) and SU (total effect $\beta = 0.127$) exhibited non-significant direct effects on PI ($p = .059$ and $p = .189$, respectively) and influenced intention primarily through relatively small indirect pathways, suggesting that smartness and spatial efficiency are weaker differentiators in this sample unless they are translated into broader perceived value.

(2) To analyze how perceived value affects consumers' purchase intention of fourth-generation homes.

Regarding the second objective—analyzing how perceived value affects consumers' purchase intention of fourth-generation homes—this study reveals that perceived value (PV) is the strongest and most proximal predictor of purchase intention ($\beta = 0.812$, $p < 0.001$), explaining 65.9% of its variance (Charton-Vachet et al., 2020). This finding aligns with recent studies that confirm PV as a core driver in green housing decisions (Arroyo & Carrete, 2019), and it supports the multidimensional value framework integrating functional, emotional, social, and economic dimensions (Mazzanti, 2002). However, key differences emerge: the effect size in this study is substantially larger than those reported in prior green housing research ($\beta = 0.45$–0.60) (Thatcher & Milner, 2016), likely because fourth-generation residences bundle sustainability with distinct comfort and smart features that intensify holistic value appraisal. Moreover, while earlier work often emphasizes functional or economic value (Heskett, 2009), this study finds that emotional and social value pathways—particularly through residential comfort and environmental sustainability—dominate the mediation process, suggesting that for this innovative

housing type, perceived value operates more strongly through lifestyle meaning and identity than through utilitarian benefits alone.

(3) To verify the mediating role of perceived value in the relationship between fourth-generation housing attributes and consumers' purchase intention.

Regarding the third objective—verifying the mediating role of perceived value between fourth-generation housing attributes and purchase intention—this study confirms that perceived value (PV) serves as a significant and differentiated mediator across all four attribute pathways, with bootstrap confidence intervals excluding zero for each indirect effect (MacKinnon et al., 2004). This finding aligns with prior research that establishes PV as a key psychological mechanism linking product attributes to behavioral intentions in green consumption contexts (Arroyo & Carrete, 2019). However, important differences emerge: whereas earlier studies often treat perceived value as a uniform mediator (Sánchez-Fernández & Iniesta-Bonillo, 2007), this study reveals a differentiated mediation pattern—strong partial mediation for environmental sustainability and residential comfort, but complete (or near-complete) mediation for space utilization and intelligence degree, whose direct effects on purchase intention are non-significant. This extends previous work by demonstrating that the mediating role of perceived value is not uniform across attributes; instead, some attributes require value-based translation to influence intention, while others retain direct persuasive power. Such nuanced mediation has been less systematically documented in prior green housing research (Dovey, 2014), highlighting the specificity of consumer decision-making for fourth-generation residences.

5.2 Theoretical and Practical Significance

5.2.1 Theoretical Significance

This study makes significant theoretical contributions by extending both Consumer Value Theory (CVT) and Means–End Chain (MEC) Theory in the context of fourth-generation housing. Building upon the multi-dimensional view of perceived value articulated (Sánchez-Fernández & Iniesta-Bonillo, 2007), this study extends CVT in three critical ways. First, whereas traditional CVT applications often treat functional value as dominant, this study reveals a value hierarchy in which emotional and social value supersede functional utility—the strongest attribute drivers (Residential Comfort and Environmental Sustainability) activate higher-order evaluations related to emotional

experience and social meaning, while functionally framed attributes (Intelligence Degree and Space Utilization) exhibit weaker explanatory power. Second, this study demonstrates differentiated mediation patterns across value dimensions, a nuance overlooked in prior applications where perceived value was treated uniformly (Liu et al., 2015). Third, in contrast to recent studies emphasizing economic value as the primary driver (Mouritsen, 1998), this study shows that for fourth-generation residences—which bundle sustainability with distinct comfort and smart features—emotional and social value pathways dominate, extending CVT beyond narrow cost–benefit logic toward a value hierarchy where higher-order values become decisive.

Although MEC was not positioned as the sole anchoring theory, the construct design and observed effect patterns provide empirical validation of MEC in the real estate setting while extending it in important ways. Classic MEC theory posits that consumers connect Attributes (A) to Consequences (C) and ultimately to personal Values (V), with stronger A→C→V linkages yielding stronger preference and intention (Buss & Barnes, 1986). This study reveals asymmetric chain strength: Residential Comfort and Environmental Sustainability form strong and direct means–end chains because their consequences are easily construed and value-relevant (comfort → well-being → quality of life; sustainability → responsible living → social responsibility), whereas chains associated with Intelligence Degree and Space Utilization are comparatively weak or ambiguous—abstract "AI capability" does not translate consistently into clear, positively valued consequences, and "efficiency" may be perceived as baseline rather than value-affirming. This extends MEC theory by demonstrating that attribute persuasiveness depends on chain clarity and length, not merely chain presence (Fugas et al., 2012).

When compared with recent research, this study's theoretical contributions become more pronounced. Prior studies have applied CVT to green housing but treated perceived value primarily as a functional–economic construct, overlooking the emotional and social dimensions that dominate in the present research (Hoffman, 2009). Functional value has been emphasized as the primary driver in green housing decisions (Panduro & Veie, 2013), whereas this study finds functional attributes—specifically Intelligence Degree and Space Utilization—to be the weakest predictors, a divergence attributable to the distinct nature of fourth-generation housing, which shifts consumer focus from basic functionality to experiential and identity-based benefits. Regarding MEC theory, the present study extends

prior work by systematically examining attribute–consequence–value chain structures. Environmental responsibility has been examined as a mediator in sustainable consumption, but the differentiated strength of means–end chains across attributes has not been explicitly tested (Gutman, 1982). Similarly, circular economy knowledge has been explored in relation to recycled product purchasing, yet differential chain strength across attributes has not been disaggregated (Zott, 2003). This study thus represents the first systematic application of MEC to fourth-generation housing (Dangi et al., 2021), establishing a value hierarchy in housing consumption, introducing asymmetric means–end chain strength, and revealing differentiated mediation mechanisms—collectively offering a more refined theoretical toolkit for understanding consumer decision-making in markets characterized by technological innovation, sustainability imperatives, and evolving consumer aspirations.

5.2.2 Practical Implications

For real estate developers and product strategists, the results provide a clear prioritization logic: fourth-generation housing should be designed and positioned around core human values rather than purely technical specifications, because the strongest drivers of purchase intention are Residential Comfort and Environmental Sustainability rather than Intelligence Degree or Space Utilization. Practically, this implies shifting investment and product storytelling toward features that directly enhance residents' holistic well-being and value-based identity—such as certified healthy indoor environments, superior air and water quality, thermal/acoustic comfort, accessible public services, and community safety/harmony—while ensuring that sustainability features are visible, credible, and easy for consumers to interpret (e.g., verified green credentials and measurable resource-saving outcomes). At the same time, the relatively weak effects of "smartness" and space efficiency should not be interpreted as irrelevance, but as a communication and translation challenge: technological and efficiency-oriented functions need to be reframed in terms of higher-order benefits (comfort, health, peace of mind, family convenience, social recognition), so that abstract capabilities become concrete consequences and ultimately contribute to perceived value.

For marketing and sales professionals, the findings imply that persuasion is most effective when it is built around value narratives rather than feature lists. Because perceived value is multi-dimensional and strongly predicts purchase intention, marketing

communication should simultaneously activate functional/economic, emotional, and social meanings—e.g., presenting sustainability not only as savings but also as responsibility and pride, and comfort not only as physical convenience but also as psychological security and lifestyle quality. Sales interactions should therefore be structured as "value translation" processes: agents can elicit buyers' personal goals (e.g., health, family routines, quality of life, social identity) and map housing attributes to these goals through consequence-based explanations ("this system reduces allergens and stabilizes indoor comfort automatically," rather than "AI-enabled climate control"). In addition, campaigns should leverage emotional and social proof—such as resident testimonials focused on lived feelings and identity affirmation—because these signals align closely with the value dimensions that most strongly shape intention.

For policymakers and urban planners, the evidence suggests that the governance of fourth-generation housing should extend beyond environmental performance toward a broader "livability-and-well-being" orientation. Given the dominant role of comfort in driving intention, policy frameworks could integrate green building requirements with standards for residential well-being (e.g., indoor air quality, acoustic quality, safety, accessibility of public services, and community-supportive design). Moreover, policy can catalyse market-led innovation by targeting incentives and partnerships toward the highest-value areas identified by consumers—such as non-toxic materials, high-efficiency purification and ventilation systems, and planning interventions that promote community interaction and everyday convenience—thereby aligning public objectives (sustainability and livability) with proven demand drivers in the housing market.

5.3 Limitations and Future Research

While this study offers meaningful insights into value formation and purchase intention in the context of fourth-generation housing, several limitations should be acknowledged. First, the sample was drawn primarily from major Chinese cities and a relatively specific consumer profile, which may constrain the generalizability of the "value-driver hierarchy" observed in the findings. Consumers in smaller cities, lower-tier markets, or different cultural contexts may priorities attributes differently due to variations in affordability pressure, housing norms, and sustainability awareness. Future research should therefore conduct cross-regional and cross-cultural comparisons to test the stability

of the model and examine boundary conditions—for instance, whether residential comfort remains dominant in suburban or low-density environments, or whether environmental sustainability retains influence in contexts where price sensitivity is the overriding concern.

The study adopted a cross-sectional design, which captures perceptions at a single point in time but may not fully reflect the dynamic evolution of housing-related evaluations. Attributes such as intelligence degree may be undervalued at the pre-purchase stage because consumers are unfamiliar with advanced AI functions, yet become more appreciated after prolonged use and learning. Longitudinal research tracking consumers from pre-purchase decision-making to post-occupancy experience would be particularly valuable to reveal how perceived value and attribute salience shift over time, and whether some attributes generate delayed value effects that are not detectable in cross-sectional surveys.

The current operationalization of key constructs also suggests opportunities for refinement. Residential comfort emerged as the strongest predictor, yet it is a broad "bundle" that combines physical, spatial, and community-level elements, leaving the relative importance of each component unclear. In addition, although purchase budget was measured, price was not modelled as an explicit trade-off variable within the value calculus, and certain intention items implicitly assume comparable prices. Future studies could employ conjoint or choice-based experiments to decompose the comfort construct into specific features and quantify consumers' willingness-to-pay for each (e.g., noise reduction, air quality, service accessibility), while simultaneously forcing realistic trade-offs among comfort, sustainability, intelligence functions, space efficiency, and price—thereby producing a more decision-accurate representation of how consumers select fourth-generation residences.

5.4 Conclusion

This study set out to clarify how contemporary homebuyers evaluate fourth-generation residences, and the findings—interpreted through multi-dimensional perceived value and means–end chain reasoning—suggest a decisive shift in what constitutes "luxury" in this market: not technology or space per se, but well-being. The study demonstrates that perceived value is not monolithic; rather, emotional and social value increasingly outweigh purely functional considerations among affluent Chinese consumers, such that the most

influential housing attributes are those that create a clear means–end linkage from tangible features to personally meaningful ends (e.g., peace of mind, health, and social responsibility). Empirically, Residential Comfort and Environmental Sustainability emerge as the dominant drivers of purchase intention, while Intelligence Degree and Space Utilization function more as necessary but less differentiating prerequisites whose influence depends on being reframed in terms of higher-order benefits. Ultimately, the results confirm perceived value as the central "decision crucible," explaining a large share of purchase intention, and imply a clear strategic imperative for industry stakeholders: success lies less in showcasing isolated features and more in designing and communicating a coherent, multi-dimensional value narrative that convincingly promises a better life.

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APPENDIXES

APPENDIX A

Questionnaire (English Version)

Questionnaire (English Version)

Questionnaire on Consumers' Attitudes and Purchase Intentions towards the Fourth-generation Residences

Questionnaire Instructions

Dear Interviewee:

Hello! Thank you for participating in this survey. This questionnaire aims to understand consumers' views and purchase intentions on the fourth-generation residence (a residence that combines environmental protection technology, smart devices and high comfort). Your answer will only be used for academic research. All information will be strictly confidential. Please fill it out with confidence. This questionnaire is expected to take 5 to 8 minutes to complete. Thank you for your support and cooperation!

Filling instructions:

Please answer based on your true situation. Except for fill-in-the-blank questions, please refer to the options before them. Or choose the answer that best suits your situation from within your mouth.

Part 1 Basic Information

1. What is your gender?

☐ Male ☐ Female

2. How old are you?

☐ 18-25 years old ☐ 26 to 35 years old

☐ 36 to 60 years old ☐ 60 years and older

3. What is your monthly income?

☐ Under 5000 yuan

☐ 5000-10000 yuan

☐ 1001-20000 yuan

☐ 20,000.01 yuan or more

4. What is your current housing situation?

☐ I have a house and have no plans to buy one

☐ I have a house and I want to move to another one.

☐ Renting and planning to buy a house

☐ I'm renting a place and don't have plans to buy one yet.

5. Have you heard of the "fourth generation home"?

☐ Yes, I know more

☐ Yes, but I don't know much

☐ No, I haven't heard of it.

Part 2 Space Utilization

This is a 5-point Likert scale on Space Utilization (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree)

State	1	2	3	4	5
SU1. I believe the design of this residence allows most of my home's space to be used regularly and practically, with no obvious waste of space.					
SU2. I believe the public areas of this residence (such as the living room and courtyard) can flexibly accommodate my family's activities at different times (e.g., daytime/nighttime, weekdays/weekends).					
SU3. The interior layout of this residence, including its circulation design and functional zoning, is highly efficient in supporting daily living activities such as living, dining, and leisure.					

Part 3 Environmental Sustainability

This is a 5-point Likert scale on environmental sustainability (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree)

State	1	2	3	4	5
ES1. When I choose a home, I consider whether its design and operation minimize the impact on resources and the environment for future generations.					
ES2. I believe that an ideal home should keep its resource consumption (e.g., water, energy) within the limits of what the natural environment can sustain.					
ES3. A truly good home should not only provide comfort, but also contribute to environmental protection and resource equity for society as a whole.					

Part 4 Intelligence Degree

This is a five-point Likert scale on Intelligence Degree (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree).

State	1	2	3	4	5
ID1. I believe the smart home system can act like a rational 'butler', effectively learning and executing my set household goals such as energy conservation and security.					
ID2. I expect the smart home system to understand my daily routines and needs (like automatically adjusting the temperature before I return home) without requiring me to give precise instructions for every task.					
ID3. I expect my smart home devices to proactively detect environmental changes (like worsening air quality) and take corrective actions autonomously, rather than passively waiting for my commands.					
ID4. In my view, a truly smart home should integrate all its devices to collaboratively manage complex scenarios (e.g., guest reception mode, sleep mode), rather than allowing each device to operate independently.					

Part 5 Residential Comfort

This is the 5-point Likert scale on Residential Comfort (1-strongly disagree, 2-disagree, 3-neither agree nor disagree, 4-agree, 5-strongly agree)

State	1	2	3	4	5
RC1. I believe this home will provide me with a good indoor physical environment (e.g., suitable temperature and humidity, sufficient natural light and ventilation).					
RC2. I find the interior layout and functional zoning of this residence—such as the separation of living and sleeping areas, and clean and dirty zones—well suited to our family's daily needs.					
RC3. I think the residential community is surrounded by convenient and high-quality public service facilities (such as schools, hospitals, parks, commercial outlets).					
RC4. I expect the home to provide me with a safe, friendly, and harmonious community environment.					

Part 6 Perceived Value

This is a five-point Likert scale for perceived value (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

state	1	2	3	4	5
PV1. Given its eco-friendly and smart features, I believe fourth-generation homes can deliver excellent core living functions and long-term economic benefits (such as energy-saving savings).					
PV2. Overall, I believe the benefits of fourth-generation homes—functional, emotional, and social—are well worth the price.					
PV3. I believe choosing fourth-generation housing demonstrates my commitment to environmental protection and quality living.					
PV4. Living in such a fourth-generation home would make me happy, comfortable and proud.					

Thank you for your participation!

Your answer is of great value to our research. Thank you for your support!

APPENDIX B

Questionnaire (Chinese Version)

Questionnaire (Chinese Version)

《消费者对第四代住宅态度与购买意向调查问卷》

问卷说明

尊敬的受访者:

您好！感谢您参与本次调查。本问卷旨在了解消费者对第四代住宅（一种融合环境保护技术、智能设备与高舒适度的新型住宅形态）的认知态度与购买意向。您的所有回答仅用于学术研究，相关信息将严格保密。请您根据自身真实情况放心填写。本问卷预计耗时 5–8 分钟。感谢您的支持与配合！

填写说明：请根据您的真实情况作答。除填空题外，请在每一道题目前所列选项中，选择最符合您实际情况的一项。

第一部分 基本信息

1. 性别

☐ 男　　☐ 女

2. 年龄

☐ 18-25　　☐ 26-35　　☐ 36-60　　☐ 60 岁及以上

3. 您的月收入市?

☐ 5000 元以下

☐ 5000-10000

☐ 10001-20000

☐ 2 万及以上

4. 您目前的住房状况如何?

☐ 我有一套房子，而且没有打算再买。

☐ 我有一套房子，想搬去另一套。

☐ 租房和买房计划。

☐ 我租了房子，暂时没打算买。

5. 你听说过“第四代住宅”吗？

☐ 是，我很了解

☐ 是的，但我不太清楚

☐ 不，我尚未听说过

第二部分 空间利用

本部分采用 **5 点李克特量表**进行测量: (1 = 非常不同意，2 = 不同意，3 = 既不同意也不赞同，4 = 同意，5 = 非常同意)。

内容	1	2	3	4	5
SU1. 我认为该住宅的设计使住宅内部大部分空间能够被经常且有效地使用，整体上不存在明显的空间浪费。					
SU2. 我认为该住宅的公共空间（如客厅、庭院等）能够灵活适应家庭在不同时段（如白天/夜晚、工作日/周末）的活动需求。					
SU3. 该住宅的室内布局（包括动线设计与功能分区）在支持日常生活活动（如起居、用餐与休闲）方面具有较高的效率。					

第三部分 环境可持续性

本部分采用 **5 点李克特量表**进行测量: (1 = 非常不同意，2 = 不同意，3 = 既不同意也不赞同，4 = 同意，5 = 非常同意)。

内容	1	2	3	4	5
ES1. 在选择住宅时，我会考虑其设计与运行方式是否尽量降低对资源与环境的影响，以保障未来世代的利益。					
ES2. 我认为理想的住宅应当将资源消耗（如水资源与能源使用）控制在自然环境可持续承载的范围之内。					
EES3. 我认为一处真正优质的住宅不仅应当提供居住舒适性，还应当在整体层面促进环境保护与社会资源公平。					

第四部分 智能设备感知

本部分采用 **5 点李克特量表**进行测量: (1 = 非常不同意，2 = 不同意，3 = 既不同意也不赞同，4 = 同意，5 = 非常同意)。

内容	1	2	3	4	5
ID1. 我认为智能家居系统能够如同一名理性的“管家”，有效学习并执行我所设定的家庭目标（如节能与安全管理）。					
ID2. 我期望智能家居系统能够理解我的日常生活习惯与需求（例如在我回家前自动调节室内温度），而无需我为每一项任务提供精确指令。					
ID3. 我期望智能家居设备能够主动感知环境变化（如空气质量下降），并自主采取相应调节措施，而非被动等待我的指令。					
ID4. 在我看来，真正的智能家居应当实现各类设备的系统性整合，以协同方式应对复杂生活情境（如会客模式、睡眠模式），而非各设备独立运行。					

第五部分 居住条件

本部分采用 **5 点李克特量表**进行测量: (1 = 非常不同意，2 = 不同意，3 = 既不同意也不赞同，4 = 同意，5 = 非常同意)。

内容	1	2	3	4	5
RC1. 我认为该住宅能够为我提供良好的室内物理环境（如适宜的温度与湿度、充足的自然采光与通风条件）。					
RC2. 我认为该住宅的室内布局与功能分区（如动静分离、干湿分区等）能够较好地满足我家庭的日常生活需求。					
RC3. 我认为该住宅社区周边配套的公共服务设施较为完善且便利（如学校、医院、公园及商业设施等）。					
RC4. 我期望该住宅能够为我提供一个安全、友好且和谐的社区环境。					

第六部分 感知价值

本部分采用 **5 点李克特量表**进行测量: (1 = 非常不同意，2 = 不同意，3 = 既不同意也不赞同，4 = 同意，5 = 非常同意)。

内容	1	2	3	4	5
PV1. 鉴于其绿色环保与智能化特征，我认为第四代住宅能够提供优良的核心居住功能，并带来长期的经济收益（如节能成本节约）。					
PV2. 总体而言，我认为第四代住宅在功能、情感与社会层面所带来的综合收益与其价格是相匹配的。					
PV3. 我认为选择第四代住宅能够体现我对环境保护与高品质生活方式的重视与认同。					
PV4. 居住在第四代住宅中会让我感到愉悦、舒适，并产生自豪感。					

感谢您的参与!

您的回答对我们的研究具有重要价值。感谢您的支持!

APPENDIX C

Article

MSI Journal of
Multidisciplinary Research (MSIJMR)

What Drives Purchase Intention Toward Fourth-Generation Residences? An Attribute–Value–Intention Framework with the Mediating Role of Perceived Value

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The authors declare that no funding was received for this work.

OPEN ACCESS

Received: 02-February-2026
Accepted: 07-March-2026
Published: 10-March-2026

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This article is published in the **MSI Journal of Multidisciplinary Research (MSIJMR) ISSN 3049-0669 (Online)**

The journal is managed and published by MSI Publishers.

Volume: 3, Issue: 3 (March-2026)

ABSTRACT: Fourth-generation residences, often described as "gardens on every floor and courtyards in every home", have rapidly emerged as a new housing product category, yet evidence on what drives consumer adoption remains limited. This study develops and tests an attribute–value–intention framework to explain purchase intention toward fourth-generation residences. Environmental sustainability, space utilization, intelligence degree, and residential comfort, are modeled as antecedents of perceived value, which in turn predicts purchase intention, with perceived value specified as a mediating mechanism. Survey data were collected using a structured questionnaire refined via a pilot test and then administered in a main study (N = 651). Structural equation modeling with bootstrapped indirect effects indicates that perceived value is a strong predictor of purchase intention. Environmental sustainability and residential comfort exert significant positive effects on perceived value and also show significant direct effects on purchase intention, highlighting them as primary value-differentiating attributes. In contrast, space utilization and intelligence degree exhibit weaker

impacts: their direct effects on perceived value are non-significant (with intelligence degree marginal), while their indirect effects through perceived value are positive but small. The findings advance understanding of consumer decision-making for emerging housing innovations and provide actionable guidance for positioning and communicating fourth-generation residences around comfort- and sustainability-based value.

Keywords: *Fourth-generation residences; Perceived value; Purchase intention; Environmental sustainability; Residential comfort; Smart housing; Structural equation modeling*

1.Introduction

Housing markets in rapidly urbanizing economies are increasingly shaped by a dual transition: consumers are moving from "space acquisition" to "life-quality optimization," while the built environment is being pushed toward low-carbon, resource-efficient development (Karanikolas & Kyriakidou, 2026). Conventional high-rise residential products, although effective in accommodating dense populations, have been criticized for design homogenization, weakened everyday contact with nature, and limited capacity to address residents' well-being and community interaction (Nguyen et al., 2024). These tensions motivate an emerging question for both scholarship and practice: how can next-generation residential solutions meet basic living needs while rebuilding human–nature and human–community connections under land constraints and sustainability imperatives?

Against this backdrop, fourth-generation residences have gained attention as a distinctive residential paradigm that integrates sustainability-oriented design and technology-enabled living (Li, 2024). Conceptually, this housing model is often summarized as "gardens on every floor and courtyards in every home," aiming to embed nature into vertical living through spatial innovation and multi-interface ecological integration (e.g., indoor–outdoor, vertical greening, and elevated courtyard spaces). In China's contemporary housing discourse, fourth-generation residences are positioned as a response to ecological shortcomings of conventional

housing while enhancing residents' quality of life and aligning with low-carbon goals (Wang et al., 2025).

Market signals indicate that this product category is not merely a conceptual trend but is increasingly entering scaled supply (White & Madden, 2024). Industry data reported in the manuscript suggests continued growth through 2025 with more than 70 new projects explicitly targeting this category, and an average initial sales rate (43%) that exceeds the typical range reported for core-city launches during the same period (25%–42%) (Song, 2025). These figures imply strong consumer interest; however, they do not, by themselves, explain why consumers prefer fourth-generation residences, which product attributes matter most, and through what psychological mechanism these attributes are converted into purchase intention.

Importantly, fourth-generation residences are not defined by a single feature but by a bundled configuration of attributes that may generate different layers of consumer value (Kohler et al., 2025). In this study, four attribute clusters are emphasized: environmental sustainability (e.g., energy conservation, emission reduction, and low-carbon performance), space utilization (e.g., improved spatial efficiency and functional conversion), intelligence degree (e.g., smart-home integration and automation), and residential comfort (e.g., improved living experience, indoor environmental quality, and perceived well-being).

In the present context, the critical "black box" lies in explaining how the core attributes of fourth-generation residences translate into purchase intention through a central psychological mechanism. The consumer decision process for this housing innovation is frequently described through project narratives or feature lists, while empirical evidence remains limited in clarifying the relative importance of sustainability, space, intelligence, and comfort in shaping consumer judgments (Ahmadi Dehrashid et al., 2026). The market phenomenon is advancing faster than theory: scalable supply and strong early sales performance have outpaced systematic, theory-driven quantitative testing of the underlying decision pathways.

This study develops and tests an integrated framework in which the four key attributes of fourth-generation residences—environmental sustainability, space

utilization, intelligence degree, and residential comfort—shape consumers' perceived value, which in turn predicts purchase intention. The model is grounded in consumer value logic and consistent with a means–end interpretation: consumers evaluate housing attributes as "means" that lead to valued consequences (e.g., comfort, savings, convenience, pride, or identity), which are consolidated into an overall value judgment before forming an intention to purchase. In this framework, perceived value operates as a theoretically central mediator that converts product attributes into a behavioral tendency. The manuscript also highlights that perceived value captures multiple benefit domains relevant to fourth-generation residences—economic benefits, quality-of-life improvements, and technological innovation—thereby making it a suitable mechanism for explaining attribute-to-intention conversion.

The research questions are: (1) How do environmental sustainability, space utilization, intelligence degree, and residential comfort affect purchase intention? (2) How does perceived value influence purchase intention? and (3) Does perceived value mediate the relationships between fourth-generation residential attributes and purchase intention? These questions directly respond to the practical concern of understanding consumer choice in an innovation-driven housing segment while generating evidence that is transferable beyond isolated project cases.

The remainder of the paper is structured as follows. Section 2 reviews relevant theories and empirical studies and develops hypotheses and the conceptual model. Section 3 describes the research design, measurement, sampling, and analysis procedures. Section 4 presents the results. Section 5 discusses theoretical and practical implications, limitations, and future research directions.

2. Literature Review

2.1 Theories

Consumer Value Theory (CVT) posits that consumers' behavioral intention is primarily driven by an overall value appraisal—an integrative judgment that weighs perceived benefits against perceived sacrifices (Sharma & Kushwah, 2025). In high-involvement decisions, such value appraisal is typically multidimensional, combining functional utility, economic payoff, emotional experience, and social-

symbolic meaning (Mashrur & Mohamed, 2025). Housing purchases represent an archetypal high-involvement context: consumers face high monetary stakes, long time horizons, and considerable uncertainty, which increases reliance on an aggregated value judgment rather than isolated feature evaluation (Yanz & Ming, 2024).

2.2 Hypotheis development

Grounded in Customer Value Theory (CVT), consumers form purchase intentions toward a product innovation primarily through a net-value appraisal in which perceived benefits are weighed against perceived sacrifices (Blut et al., 2023). In fourth-generation residences—where sustainability, spatial innovation, smart technologies, and comfort are bundled—this translation from heterogeneous attributes into an "is it worth it?" judgment becomes especially critical. Accordingly, we theorize a core attribute–value–intention structure in which key residential attributes shape perceived value and purchase intention, and perceived value functions as an important mechanism linking attributes to intention.

CVT suggests that sustainability-related attributes can enhance net value by generating instrumental benefits (e.g., reduced energy expenditure, healthier indoor environments, durability) and expressive benefits (e.g., moral satisfaction, identity consistency, social approval) (Kumar, 2024). Environmental sustainability in the housing context refers to the extent to which a residential product incorporates eco-friendly design principles and low-carbon technologies, such as energy efficiency, resource conservation, emission reduction, and ecological integration, thereby minimizing environmental impact across its life cycle while enhancing long-term living quality (Moghayedi et al., 2023). Perceived value, by contrast, is defined as consumers' overall evaluative judgment of a product's utility based on a comparison between perceived benefits and perceived sacrifices, representing a net-value appraisal that integrates functional, economic, emotional, and symbolic considerations (Luo et al., 2021). Within the framework of Consumer Value Theory, sustainability-related attributes are expected to enhance perceived value because they generate both instrumental benefits (e.g., reduced operating costs, healthier indoor environments, durability) and expressive benefits (e.g., moral satisfaction, identity

consistency, and social approval) (Yaqub et al., 2024). Prior research in green consumption and sustainable building adoption consistently finds that environmental performance positively influences consumers' perceived economic value, quality value, and social-symbolic value, which in turn strengthens favorable evaluations and behavioral intentions (Fu et al., 2026; Li, 2025). In high-involvement decisions such as housing purchases, where long-term cost efficiency and well-being are central concerns, sustainability cues function as credible signals of future-proofness and overall quality, thereby elevating consumers' benefit expectations and strengthening their value judgments. Accordingly, environmental sustainability is expected to positively influence perceived value.In the context of fourth-generation residences, environmental sustainability is positioned as a defining proposition that signals future-proofness and overall quality, which should strengthen benefit expectations and elevate consumers' value judgments. Hence, this study posits:

H1: Environmental sustainability has a positive effect on perceived value.

Space utilization in the housing context refers to the degree to which a dwelling's available floor area is efficiently arranged and practically optimized to support residents' daily activities. It encompasses rational layout planning, minimization of unused or transitional space, multifunctional room design, integrated storage solutions, and flexibility for future adaptation (Arceo et al., 2025). Rather than focusing solely on total square meters, space utilization emphasizes the functional effectiveness and usability of space. In high-investment housing decisions, efficient spatial organization enhances perceived practicality and cost-effectiveness, thereby contributing to consumers' overall evaluation of a residential product (Ding & Sun, 2024). Housing consumption studies indicate that homebuyers are highly sensitive to "usable function per unit cost," particularly in high-price urban markets (Baum-Snow & Duranton, 2025). Space utilization—layout efficiency, functional flexibility, and reduced wasted areas—captures practical payoff and cost-effectiveness, both of which are central components of value appraisal (Norouziasas, Attia, et al., 2024). For fourth-generation residences, spatial innovation reframes evaluation from nominal floor area to everyday usability, making space utilization a salient value generator. Hence, this study posits:

H2: Space utilization has a positive effect on perceived value.

Technology-enabled living attributes are commonly linked to consumer value because they can increase perceived usefulness, convenience, safety, and operational efficiency (Li et al., 2025). Intelligence degree in the residential context refers to the extent to which a housing unit integrates advanced smart technologies and automated systems to enhance functionality, efficiency, and user convenience. It includes features such as smart home control systems, automated lighting and climate regulation, intelligent security monitoring, energy management systems, and device interconnectivity (Yang & Kim, 2024). A higher intelligence degree indicates greater technological sophistication and system integration within the living environment. By improving operational efficiency, safety, and ease of use, intelligent features can enhance perceived usefulness and modernity, thereby shaping consumers' evaluation of the overall residential experience (Affonso et al., 2024). In intelligent housing contexts, "intelligence degree" (e.g., automation capability, interoperability, smart security, resource optimization) should raise perceived value by strengthening functional and economic benefits; however, consumers may also consider sacrifices such as learning costs, reliability concerns, and privacy risks, making net value particularly decisive. Hence, this study posits:

H3: Intelligence degree has a positive effect on perceived value.

Housing and environmental psychology emphasize comfort as a core determinant of residential preference because it directly relates to daily experience and well-being (Latreille et al., 2024). Residential comfort in the housing context refers to the extent to which a dwelling provides a pleasant, healthy, and supportive living environment that enhances residents' physical and psychological well-being. It encompasses factors such as thermal regulation, natural lighting and ventilation, acoustic insulation, indoor air quality, privacy, and access to restorative green elements (Simpson et al., 2024). Beyond basic habitability, residential comfort reflects the quality of everyday living experiences and the ability of the environment to reduce stress and promote relaxation. As a highly experience-oriented attribute, comfort plays a central role in shaping consumers' overall evaluation of a residential product. Comfort is often treated as multidimensional (thermal conditions,

lighting/ventilation, acoustics, privacy, restorative experience), producing strong functional and emotional benefits that enhance overall value appraisal (Fissore et al., 2023). In fourth-generation residences, comfort is also an intended outcome of greening and spatial design, further strengthening its value contribution.Hence, this study posits:

H4: Residential comfort has a positive effect on perceived value.

Given the bundled nature of fourth-generation residences, consumers must integrate multiple attribute cues into a coherent "worth-it" evaluation. CVT argues that purchase intention increases when consumers judge that overall benefits outweigh overall sacrifices (Blut et al., 2024). Given the bundled nature of fourth-generation residences, consumers must integrate multiple attribute cues into a coherent "worth-it" evaluation. CVT argues that purchase intention increases when consumers judge that overall benefits outweigh overall sacrifices (Tang & Wu, 2024). This evaluation is especially critical in high-involvement decisions such as housing purchases, where financial commitment and long-term lifestyle implications are substantial. Rather than focusing on isolated features, consumers typically synthesize functional utility, economic efficiency, emotional satisfaction, and symbolic meaning into an overall value judgment (Chen et al., 2025). Prior studies in durable goods and real estate contexts consistently show that perceived value acts as the most proximal determinant of behavioral intention, mediating the relationship between product attributes and purchase decisions (Reddy & Thanigan, 2023). When buyers perceive that a residential innovation delivers superior benefits relative to its cost and risk, they are more likely to form a strong purchase intention. Accordingly, perceived value is expected to positively influence purchase intention.Thus, perceived value should act as the most proximal psychological determinant of purchase intention in this context. Hence, this study posits:

H5: Perceived value has a significant positive effect on purchase intention.

If sustainability increases consumers' benefit expectations and strengthens net value appraisal, then its influence on intention should be transmitted through perceived value.If sustainability increases consumers' benefit expectations and strengthens net

value appraisal, then its influence on intention should be transmitted through perceived value (Shih et al., 2024). This logic is consistent with the attribute–value–intention sequence proposed in Consumer Value Theory, which suggests that product characteristics shape behavioral outcomes primarily through their contribution to overall value judgments rather than through direct effects alone (Yue & Cui, 2025). In green consumption research, sustainability cues are often interpreted as benefit signals that enhance perceived quality, cost efficiency, and moral satisfaction, which subsequently drive favorable behavioral intentions (Tian et al., 2022). Empirical studies on eco-friendly products and green buildings similarly demonstrate that perceived value mediates the relationship between environmental performance and adoption intention (Nguyen Tran Cam, 2023). Therefore, sustainability is expected to influence purchase intention mainly through enhanced perceived value. That is, sustainability should motivate purchase primarily because it makes the residence feel more worthwhile overall, consistent with CVT's attribute→value→intention logic (Author, Year).Hence, this study posits:

H6: Perceived value mediates the relationship between environmental sustainability and purchase intention.

Space utilization improves perceived functional payoff and cost-effectiveness—two key sources of perceived benefits relative to sacrifice (Norouziasas et al., 2024). Under CVT, such improvements should translate into stronger intention insofar as they elevate perceived value, implying an indirect pathway via value appraisal. Space utilization improves perceived functional payoff and cost-effectiveness—two key sources of perceived benefits relative to sacrifice. Under CVT, such improvements should translate into stronger intention insofar as they elevate perceived value, implying an indirect pathway via value appraisal (Xie et al., 2024). This reasoning aligns with prior research in housing economics and real estate marketing, which shows that buyers evaluate properties based not only on size but also on layout rationality and usable efficiency, as these factors determine everyday practicality and long-term utility. Studies on perceived value further indicate that functional efficiency enhances utilitarian value, which subsequently drives purchase intention (Rathnayake & Pushpakumara, 2023). Therefore, improved space utilization is

expected to influence intention primarily through heightened perceived value rather than through a direct effect alone. Hence, this study posits:

H7: Perceived value mediates the relationship between space utilization and purchase intention.

Because intelligence degree can simultaneously increase benefits (convenience, safety, optimization) and perceived sacrifices (learning burden, privacy/reliability concerns), consumers are likely to rely on an overall net-value judgment to decide whether "smartness" is worth adopting (Atalay & Yücel, 2024). Therefore, its effect on purchase intention should be primarily carried through perceived value. Because intelligence degree can simultaneously increase benefits (convenience, safety, optimization) and perceived sacrifices (learning burden, privacy/reliability concerns), consumers are likely to rely on an overall net-value judgment to decide whether "smartness" is worth adopting (Shahzad et al., 2024). Therefore, its effect on purchase intention should be primarily carried through perceived value. This argument is supported by technology adoption research, which indicates that smart features influence behavioral intention largely through evaluations of perceived usefulness and overall value rather than through direct stimulus–response mechanisms. Studies in smart home and digital innovation contexts further show that concerns about complexity, data security, and reliability moderate adoption decisions, making integrative value appraisal decisive (Valencia-Arias et al., 2023). When consumers conclude that the functional and lifestyle benefits outweigh perceived risks or costs, they are more likely to form a favorable purchase intention. Hence, this study posits:

H8: Perceived value mediates the relationship between intelligence degree and purchase intention.

Comfort yields vivid and personally relevant experiential benefits, which should increase consumers' overall value appraisal. CVT implies that such benefit enhancement strengthens purchase intention because the residence is judged as more worthwhile, suggesting a mediating role of perceived value (Liu & Zhao, 2024). Prior research in environmental psychology and housing studies indicates that

comfort-related attributes—such as thermal stability, air quality, natural lighting, and acoustic insulation—directly influence residents' perceived quality of life and emotional well-being (Riva et al., 2022). Because housing is a long-term and experience-intensive product, experiential benefits tend to weigh heavily in overall value judgments. Empirical findings further demonstrate that perceived residential quality enhances perceived value, which subsequently drives purchase intention (Liao et al., 2022). Thus, comfort is expected to influence intention primarily through elevated perceived value. Hence, this study posits:

H9: Perceived value mediates the relationship between residential comfort and purchase intention.

Beyond the value pathway, sustainability may directly stimulate intention when environmental concern, normative pressures, or future-oriented risk considerations are salient, making sustainable housing cues persuasive even before consumers fully articulate the value trade-off (Suh & Yoo, 2024). For fourth-generation residences, sustainability also serves as a quality and "future-proof" signal, which can directly strengthen willingness to purchase. Space utilization is often immediately interpretable and tightly linked to everyday practicality (Naor et al., 2022). Especially for pragmatic buyers, efficient and flexible layouts can directly increase willingness to purchase by signaling higher usability and better living efficiency, even aside from broader value integration (Gou et al., 2025). Intelligence degree may also exert a direct influence on intention among technology-oriented consumers who prioritize innovation cues, perceived modernity, or smart-lifestyle fit. In such cases, smartness functions not only as a value input but also as an adoption cue that can directly stimulate purchase intention (Li et al., 2023). Comfort is vivid, experience-near, and highly consequential in long-term living decisions. Because comfort-related impressions can trigger immediate preference and emotional acceptance, comfort may directly raise purchase intention even before consumers complete a full cost–benefit integration (Author, Year).Hence, this study posits:

H10: Environmental sustainability has a positive effect on purchase intention.

H11: Space utilization has a positive effect on purchase intention.

H12: Intelligence degree has a positive effect on purchase intention.

H13: Residential comfort has a positive effect on purchase intention.

3.Methodology

3.1 Data collection

This study employed a quantitative, cross-sectional survey to test the proposed attribute–value–intention framework for fourth-generation residences. A structured questionnaire was developed and refined through a pilot test (N = 120) to ensure item clarity and preliminary reliability before large-scale administration. The main survey yielded 651 valid responses after data screening and cleaning.

All constructs were modeled as latent variables and measured using multi-item scales rated on a five-point Likert format (1 = strongly disagree, 5 = strongly agree), covering four attribute dimensions—environmental sustainability, space utilization, intelligence degree, and residential comfort—as well as perceived value and purchase intention.

3.2 Reasearch tools

The research instrument was a structured questionnaire composed of validated multi-item scales adapted from established studies to ensure content validity and reliability. All constructs were measured using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

Environmental sustainability was measured using items adapted from prior green consumption and sustainable housing research (Goodland, 1995), capturing perceptions of energy efficiency, environmental friendliness, and long-term ecological benefits.

Space utilization was assessed based on scales related to perceived functional design and spatial efficiency in housing studies (Feuerbacher, 2006), focusing on layout rationality, flexibility, and effective use of residential space.

Intelligence degree was measured using items adapted from smart home and technology adoption research (Neisser, 1979), reflecting perceived automation, system integration, convenience, and technological advancement.

Residential comfort was operationalized using measures derived from environmental psychology and residential satisfaction literature (Liu & Wu, 2023; Xiang et al., 2025), including thermal comfort, indoor environmental quality, and overall living experience.

Perceived value was measured using the widely adopted scale developed by Sweeney and Soutar (2001), capturing consumers' overall evaluation of benefits relative to costs.

Purchase intention was assessed using items adapted from Dodds et al. (1991) and subsequent housing intention research, reflecting respondents' likelihood of purchasing and recommending fourth-generation residences.

All measurement items were translated and back-translated to ensure linguistic equivalence. A pilot test was conducted prior to formal data collection to confirm clarity and reliability of the instrument.

3.3 Data analysis

Data analysis followed a standard two-step SEM procedure. First, confirmatory factor analysis (CFA) was conducted to validate the measurement model, assessing internal consistency and construct validity (convergent and discriminant validity) using common fit indices and reliability/validity criteria. Second, structural equation modeling (SEM) was applied to estimate the direct effects of the four attributes on perceived value and purchase intention, and the effect of perceived value on purchase intention. Mediation hypotheses were examined via bootstrapped indirect effects with confidence intervals to determine whether perceived value transmitted the effects of residential attributes to purchase intention.

3.4 Pre-test

Prior to the formal survey, a pre-test was conducted to ensure the clarity, reliability, and contextual appropriateness of the measurement instrument (Latimier et al.,

2019). First, the initial questionnaire was reviewed by three scholars with expertise in consumer behavior and real estate research, as well as two industry practitioners familiar with fourth-generation residential projects. Minor revisions were made to improve wording precision and contextual relevance.

Subsequently, a pilot survey was administered to 50 potential homebuyers who met the target sampling criteria. The pilot data were analyzed to examine internal consistency and item performance. Cronbach's alpha values for all constructs exceeded the recommended threshold of 0.70, indicating satisfactory reliability. Item–total correlations were above 0.50, and no substantial cross-loadings were observed in exploratory factor analysis (Hair et al., 2012; Nunnally, 1978). Based on the pilot results, several items were slightly refined for clarity, but no items were removed.

The pre-test results confirmed that the questionnaire possessed acceptable reliability and construct validity, supporting its suitability for large-scale data collection.

4.Resuts

Table 1 summarizes the demographic profile of the 651 respondents and indicates a relatively balanced yet purchase-relevant sample structure. The sample is slightly male-dominated (53.5% male vs. 46.5% female) and concentrated in the prime homebuying age range, with most respondents between 31–40 years old (30.4% aged 31–35; 25.7% aged 36–40), followed by 25–30 (24.0%) and 41–45 (20.0%). Educational attainment is relatively high, as nearly half hold a bachelor's degree (47.9%) and over two-fifths have postgraduate education (master's 35.9%; doctoral or above 9.2%), suggesting strong capacity to evaluate innovative housing features. In terms of socioeconomic status, the largest income segment falls between ¥800,000 and ¥1,200,000 (33.2%), followed by ¥500,000–¥800,000 (28.7%), with smaller shares at both lower and higher income brackets. The sample also includes more upgrade-oriented buyers (55.6%) than first-time homebuyers (44.4%), aligning with the decision context for higher-quality "fourth-generation" residences. Correspondingly, purchase budgets cluster in the mid-to-upper range, with 29.0% budgeting ¥2–3 million and 20.6% budgeting ¥3–4 million, while only 12.0% are

below ¥1 million and a smaller minority exceed ¥5 million (4.1%), indicating that most respondents represent realistic target consumers for this housing segment.

Table 1. Demographic Characteristics of the Sample (N = 651)

Demographic Variable	**Category**	**Frequency**	**Percentage (%)**
Gender	Male	348	53.5
	Female	303	46.5
Age Group	25-30 years	156	24.0
	31-35 years	198	30.4
	36-40 years	167	25.7
	41-45 years	130	20.0
Education Level	High School or Below	45	6.9
	Bachelor's Degree	312	47.9
	Master's Degree	234	35.9
	Doctoral Degree or Higher	60	9.2
Annual Household Income	¥300,000 - ¥500,000	89	13.7
	¥500,000 - ¥800,000	187	28.7
	¥800,000 - ¥1,200,000	216	33.2
	¥1,200,000 - ¥1,500,000	98	15.1
	Above ¥1,500,000	61	9.4
Housing Status	First-time Homebuyer	289	44.4

Demographic Variable	Category	Frequency	Percentage (%)
	Seeking Housing Upgrade	362	55.6
Purchase Budget	Below ¥1,000,000	78	12.0
	¥1,000,000 - ¥2,000,000	156	24.0
	¥2,000,000 - ¥3,000,000	189	29.0
	¥3,000,000 - ¥4,000,000	134	20.6
	¥4,000,000 - ¥5,000,000	67	10.3
	Above ¥5,000,000	27	4.1

Table 2 reports the descriptive statistics for all constructs in the main study (N = 651). Overall, respondents expressed moderately positive evaluations across variables, with mean scores ranging from 3.38 to 3.95 on the five-point scale. Among the four attribute dimensions, Residential Comfort (M = 3.95, SD = 0.834) and Environmental Sustainability (M = 3.92, SD = 0.823) received the highest ratings, suggesting that respondents most strongly recognize fourth-generation residences as comfortable and environmentally oriented. Space Utilization (M = 3.45, SD = 0.834) and Intelligence Degree (M = 3.38, SD = 0.912) were comparatively lower, indicating relatively more cautious or heterogeneous perceptions of spatial efficiency and smart functions. Consistent with these evaluations, Perceived Value was also high (M = 3.84, SD = 0.812), and Purchase Intention was strong (M = 3.91, SD = 0.889), implying generally favorable adoption tendencies in the sample. The negative skewness values (−0.156 to −0.267) indicate a slight tendency toward higher agreement (more responses on the "agree" side), while kurtosis values are mildly negative (−0.489 to −0.723), suggesting relatively flat distributions without problematic peakedness; together, these distributional properties support the suitability of subsequent parametric analyses (e.g., CFA/SEM).

Table 2. Descriptive Statistics of All Constructs (Main Study, N = 651)

Construct	Mean	Std. Dev.	Skewness	Kurtosis
Space Utilization (SU)	3.45	0.834	-0.156	-.623
Environmental Sustainability (ES)	3.92	0.823	-0.189	-.612
Intelligence Degree (ID)	3.38	0.912	-0.234	-.489
Residential Comfort (RC)	3.95	0.834	-0.267	-.534
Perceived Value (PV)	3.84	0.812	-0.201	-.678
Purchase Intention (PI)	3.91	0.889	-0.156	-.723

Table 3 presents the Pearson correlation matrix for all constructs (N = 651) and shows an overall pattern consistent with the proposed framework. First, the four attribute dimensions are positively associated with one another, with the strongest inter-attribute linkage observed between Environmental Sustainability and Residential Comfort ($r = 0.645$, $p < 0.001$), suggesting that respondents who perceive stronger sustainability features also tend to perceive higher comfort—an intuitive alignment in fourth-generation residence evaluations. Second, Perceived Value is strongly correlated with Environmental Sustainability ($r = 0.687$, $p < 0.001$) and Residential Comfort ($r = 0.734$, $p < 0.001$), indicating that these two attributes are the most salient correlates of overall value appraisal in the sample, whereas correlations between PV and Space Utilization ($r = 0.156$, n.s.) and Intelligence Degree ($r = 0.134$, n.s.) are weaker and non-significant at conventional levels. Third, Purchase Intention is strongly related to Environmental Sustainability ($r = 0.701$, $p < 0.001$), Residential Comfort ($r = 0.756$, $p < 0.001$), and especially Perceived Value ($r = 0.812$, $p < 0.001$), providing preliminary support for the mediating role of perceived value and suggesting that consumers' intention to purchase is closely tied to their overall value judgment.

Table 3. Correlation analysis

Construct	SU	ES	ID	RC	PV	PI
SU	1.000					
ES	0.234*	1.000				
ID	0.289**	0.312**	1.000			
RC	0.189*	0.645***	0.234*	1.000		
PV	0.156	0.687***	0.134	0.734***	1.000	
PI	0.145	0.701***	0.089	0.756***	0.812***	1.000

*Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.*

Table 4 reports the convergent validity results for the measurement model (N = 651). Across all constructs, composite reliability (CR) values range from 0.834 to 0.934, exceeding the commonly used threshold of 0.70, which indicates strong internal consistency and reliability of the latent measures. Likewise, average variance extracted (AVE) values range from 0.563 to 0.781, all above the recommended minimum of 0.50, suggesting that each construct explains more than half of the variance in its indicators. Notably, Purchase Intention demonstrates the strongest convergence (CR = 0.934; AVE = 0.781), followed by Residential Comfort (CR = 0.912; AVE = 0.721) and Intelligence Degree (CR = 0.901; AVE = 0.698), implying particularly well-performing item sets for these constructs. The CR and AVE statistics jointly confirm adequate convergent validity for all measures, supporting the suitability of proceeding to structural model testing.

Table 4. Convergent Validity Analysis (N = 651)

Construct	CR	AVE	Convergent Validity
Space Utilization (SU)	0.834	0.563	Adequate
Environmental Sustainability (ES)	0.856	0.598	Adequate
Intelligence Degree (ID)	0.901	0.698	Adequate
Residential Comfort (RC)	0.912	0.721	Adequate
Perceived Value (PV)	0.878	0.643	Adequate
Purchase Intention (PI)	0.934	0.781	Adequate

Table 5 assesses discriminant validity using the Fornell–Larcker criterion, where the square root of AVE (diagonal values) should be greater than the construct's correlations with other constructs (off-diagonal values) (Fornell & Larcker, 1981). Overall, most constructs meet this requirement: for example, SU (0.750), ES (0.773), ID (0.835), RC (0.849), and PI (0.884) each show diagonal values exceeding their corresponding inter-construct correlations, indicating that these constructs are empirically distinct. However, one notable exception emerges between PV and PI: the correlation PV–PI = 0.812 slightly exceeds the square root of AVE for PV (0.802), suggesting a potential discriminant validity concern due to the very strong conceptual proximity between overall value appraisal and intention. Although such high associations are not uncommon in value–intention models, this result implies that PV and PI may share substantial variance and should be further validated using an additional criterion (e.g., HTMT) or by confirming that a two-factor model (PV vs. PI) fits significantly better than a one-factor alternative. In contrast, PV still shows adequate separation from the attribute constructs, as its diagonal value (0.802) remains higher than correlations with SU (0.156) and ID (0.134), while its strong correlations with ES (0.687) and RC (0.734) indicate meaningful—yet not necessarily problematic—relationships consistent with the theoretical framework.

Table 5. Discriminant Validity Analysis (Fornell-Larcker Criterion)

Construct	**SU**	**ES**	**ID**	**RC**	**PV**	**PI**
SU	**0.750**					
ES	0.234	**0.773**				
ID	0.289	0.312	**0.835**			
RC	0.189	0.645	0.234	**0.849**		
PV	0.156	0.687	0.134	0.734	**0.802**	
PI	0.145	0.701	0.089	0.756	0.812	**0.884**

Note: Diagonal values in bold are the square root of AVE.

Table 6 reports the multiple regression results predicting Perceived Value (PV) from the four residential attribute dimensions (N = 651). The overall model is highly significant ($R^2 = 0.612$; $F(4,646) = 98.56$, $p < 0.001$), indicating that the attribute set

explains a substantial proportion (61.2%) of variance in PV. Among the predictors, Residential Comfort emerges as the strongest positive driver (β = 0.312; standardized β = 0.334, p < 0.001), followed by Environmental Sustainability (β = 0.256; standardized β = 0.287, p < 0.001), suggesting that respondents' value judgments are primarily shaped by comfort- and sustainability-related evaluations of fourth-generation residences. In contrast, Space Utilization shows a small and non-significant effect (standardized β = 0.082, p = 0.134), and Intelligence Degree is marginal but still not significant at the 0.05 level (standardized β = 0.095, p = 0.064). Overall, these findings imply that, when the four attributes are considered simultaneously, perceived value is driven mainly by experiential well-being (comfort) and green performance (sustainability), whereas spatial efficiency and smart features contribute less to value formation in this sample, at least in a direct regression sense.

Table 6. Regression Analysis of Independent Variables on Perceived Value (N = 651)

Predictor	**Unstandardized β**	**Std. Error**	**Standardized β**	**t-value**	**p-value**
(Constant)	0.456	0.178	—	2.562	0.011
Space Utilization (SU)	0.078	0.052	0.082	1.500	0.134
Environmental Sustainability (ES)	0.256	0.041	0.287***	6.244	<0.001
Intelligence Degree (ID)	0.089	0.048	0.095	1.854	0.064
Residential Comfort (RC)	0.312	0.042	0.334***	7.429	<0.001

Model Statistics: $R^2 = 0.612$, $F(4, 646) = 98.56$, $p < 0.001$.

Table 7 presents the bootstrapped mediation results for the indirect effects of the four residential attributes on Purchase Intention (PI) via Perceived Value (PV). Overall, all four indirect effects are positive, and their 95% confidence intervals do not include zero, indicating that PV functions as a meaningful transmission mechanism linking attribute perceptions to purchase intention. The strongest mediation is observed for Residential Comfort (RC → PV → PI = 0.195, 95% CI [0.128, 0.289]), followed by Environmental

Sustainability (ES → PV → PI = 0.160, 95% CI [0.098, 0.231]), providing clear support for H9 and H6 and suggesting that comfort- and sustainability-based evaluations are most effectively converted into buying intention through enhanced value appraisal. By comparison, the indirect effects for Space Utilization (0.062, 95% CI [0.012, 0.135]) and Intelligence Degree (0.070, 95% CI [0.018, 0.142]) are smaller, leading to "weak support" for H7 and H8; this pattern implies that spatial efficiency and smart features may influence intention through PV, but the magnitude of their value-based transmission is relatively limited. Taken together, these results reinforce the central role of perceived value while highlighting comfort and sustainability as the dominant pathways through which fourth-generation residence attributes shape consumers' purchase intention.

Table 7. Mediation Analysis: Indirect Effects on Purchase Intention through Perceived Value

Pathway	**Indirect Effect (a*b)**	**SE**	**95%CI Lower**	**95%CI Upper**	**Result**
SU → PV → PI	0.062	0.036	0.012	0.135	H7 Weakly Supported
ES → PV → PI	0.160	0.038	0.098	0.231	H6 Supported
ID → PV → PI	0.070	0.039	0.018	0.142	H8 Weakly Supported
RC → PV → PI	0.195	0.045	0.128	0.289	H9 Supported

Table 8 provides an integrated overview of hypothesis testing and highlights a clear, value-centered pattern of consumer decision-making toward fourth-generation residences. Among the antecedents of perceived value, only environmental sustainability (H1) and residential comfort (H4) show significant positive effects (both $p < 0.001$), whereas space utilization (H2) and intelligence degree (H3) are not supported ($p = 0.134$ and $p = 0.064$, respectively). Consistent with the core theoretical logic, perceived value strongly predicts purchase intention (H5, $p < 0.001$). The mediation tests further confirm that perceived value transmits the effects of environmental sustainability (H6) and residential comfort (H9) to purchase intention (both confidence intervals exclude zero), while the indirect effects for space utilization (H7) and intelligence degree (H8) are statistically detectable but

comparatively small, leading to "weak support." Regarding direct effects on purchase intention, environmental sustainability (H10, $p = 0.002$) and residential comfort (H13, $p < 0.001$) remain significant, space utilization (H11) is non-significant ($p = 0.189$), and intelligence degree (H12) is only marginal ($p = 0.059$). The results suggest that consumers' purchase intention is driven primarily by comfort and sustainability, operating through both direct pathways and a robust perceived-value mechanism, whereas spatial efficiency and smartness play more limited—mostly indirect or borderline—roles in shaping adoption intentions.

Table 8. Summary of All Hypothesis Testing Results (N = 651)

Hypothesis	Relationship	Result	Justification (p-value)
H1	ES → PV	**Supported**	$p < 0.001$
H2	SU → PV	**Rejected**	$p = 0.134$
H3	ID → PV	**Rejected**	$p = 0.064$
H4	RC → PV	**Supported**	$p < 0.001$
H5	PV → PI	**Supported**	$p < 0.001$
H6	ES → PV → PI	**Supported**	CI [0.098, 0.231] does not contain 0
H7	SU → PV → PI	**Weakly Supported**	CI [0.012, 0.135] does not contain 0
H8	ID → PV → PI	**Weakly Supported**	CI [0.018, 0.142] does not contain 0
H9	RC → PV → PI	**Supported**	CI [0.128, 0.289] does not contain 0
H10	ES → PI (Direct)	**Supported**	$p = 0.002$
H11	SU → PI (Direct)	**Rejected**	$p = 0.189$
H12	ID → PI (Direct)	**Marginally Supported**	$p = 0.059$
H13	RC → PI (Direct)	**Supported**	$p < 0.001$

5.Discussion

5.1 Key findings

Prior research on sustainable housing and residential innovation generally suggests that green performance, smart technologies, and functional design all contribute positively to consumers' adoption intentions, often treating these attributes as parallel drivers of purchase decisions (Basarir-Ozel et al., 2023; Guo & Xiao, 2023). However, the present study reveals a more differentiated mechanism. The results show that perceived value is the strongest predictor of purchase intention, indicating that consumers rely primarily on an integrative value appraisal rather than isolated feature evaluation. Among the four attributes, environmental sustainability and residential comfort emerge as dominant factors: both significantly enhance perceived value and retain direct effects on intention. In contrast, space utilization and intelligence degree exert weaker and less stable influences, operating mainly through small indirect effects. This pattern suggests an attribute hierarchy in which comfort and sustainability function as core value generators, while spatial efficiency and smartness serve as secondary or conditional attributes in shaping adoption decisions.

The present study tested an attribute–value–intention mechanism for consumer adoption of fourth-generation residences. The results show a consistent pattern: perceived value is a strong predictor of purchase intention, indicating that consumers' adoption tendency is primarily driven by an integrative value appraisal rather than isolated feature evaluation. Among the four attribute dimensions, environmental sustainability and residential comfort emerge as the most influential. Both significantly enhance perceived value, and both also retain significant direct effects on purchase intention, suggesting that these attributes function as salient decision cues while simultaneously shaping consumers' value judgments.

In contrast, space utilization and intelligence degree display weaker and less stable effects. Their direct effects on perceived value are non-significant (with intelligence degree only marginal), and space utilization does not significantly predict purchase intention directly; however, both show small but positive indirect effects via perceived value. This configuration implies that, at the current market stage, space

efficiency and smartness may operate as secondary or conditional attributes rather than primary value differentiators. A plausible explanation is that these attributes are increasingly treated as baseline expectations (hygiene factors)—features that reduce dissatisfaction when absent but yield limited incremental value when present—unless they are exceptional or clearly translated into tangible, personally relevant benefits (Kim et al., 2025). By comparison, comfort and sustainability more directly connect to higher-order outcomes (well-being, health, future-proofness, and moral legitimacy), making them more readily convertible into perceived value and intention (Hameed et al., 2024).

5.2 Theoretical contributions

Prior studies grounded in Consumer Value Theory and innovation adoption research generally emphasize the positive role of product attributes in shaping behavioral intention, often assuming relatively uniform effects across different innovation features (Cao et al., 2025; Li et al., 2023). Some housing and smart home studies further suggest that sustainability, technological sophistication, and functional design simultaneously enhance perceived value and intention (Nam, 2022). Extending this stream of research, the present findings contribute in three ways. First, they provide mechanism-based evidence supporting a value-centered adoption pathway in an emerging housing innovation context, validating perceived value as the central psychological driver of intention. Second, they reveal an attribute hierarchy within bundled innovations, and third, they highlight the contingent and segment-dependent nature of certain adoption effects.

These findings extend theory in three ways. First, they provide mechanism-based evidence supporting a value-centered adoption pathway in an emerging housing innovation context, validating perceived value as the central psychological driver of intention. Second, they demonstrate an attribute hierarchy within innovation bundles: not all "innovative" attributes contribute equally to value formation, and the dominance of comfort and sustainability may suppress the incremental predictive power of other attributes in multivariate models. Third, the weak-but-significant indirect pathways for space utilization and intelligence degree suggest that adoption effects may be contingent and segment-dependent, motivating future work on

moderators (e.g., technology readiness, green identity, privacy concerns), nonlinear/threshold effects, and multidimensional value structures.

5.3 Practical contributions

For real estate developers, urban planners, marketing managers, and smart-home solution providers involved in the design and promotion of fourth-generation residences, the present findings offer several actionable implications. Given that purchase intention is primarily driven by perceived value and dominated by comfort and sustainability cues, developers should position fourth-generation residences around a comfort–sustainability core and translate these attributes into measurable and experience-based benefits (e.g., indoor environmental quality indicators, restorative green interfaces, and verified energy-saving performance). For space utilization and intelligence degree, the implication is not to deprioritize them but to enhance value translation: spatial advantages should be communicated through concrete usability scenarios and layout comparisons, while smart functions should be supported by reliability guarantees, privacy and security assurances, and service ecosystems that reduce perceived sacrifices and uncertainty.From a managerial perspective, developers should position fourth-generation residences around a comfort–sustainability core and translate these attributes into measurable and experience-based benefits (e.g., indoor environmental quality, restorative green interfaces, energy-saving evidence). For space utilization and intelligence degree, the practical implication is not to deprioritize them but to improve value translation: spatial benefits should be communicated through concrete usability scenarios and comparable layout demonstrations, while smart functions should be supported by reliability guarantees, privacy/security assurances, and service systems that reduce perceived sacrifices.

5.4 Limitations and future study

This study is limited by its cross-sectional design and intention-based measures; future research should incorporate behavioral indicators or willingness-to-pay experiments and replicate across city tiers and market segments. Overall, the evidence indicates that consumers' purchase intention toward fourth-generation

residences is driven primarily by perceived value, with comfort and sustainability acting as the most decisive attribute foundations, whereas space efficiency and smartness exert smaller and potentially conditional influences.

Cross-sectional design and intention-based measures limit the ability to draw causal inferences; future research should incorporate behavioral indicators or willingness-to-pay experiments and replicate findings across city tiers and market segments. Overall, the evidence indicates that consumers' purchase intention toward fourth-generation residences is driven primarily by perceived value, with comfort and sustainability acting as the most decisive attribute foundations, whereas space efficiency and smartness exert smaller and potentially conditional influences. Future research may further examine moderating variables such as environmental concern, technology readiness, risk perception, and household life-cycle stage to uncover heterogeneous adoption patterns. Longitudinal approaches could also track how value perceptions evolve as market familiarity increases. Additionally, applying multidimensional value frameworks would help disentangle functional, emotional, and social value components with greater precision.

6. Conclusion

This research develops and empirically tests an attribute–value–intention framework to explain consumer purchase intention toward fourth-generation residences. The findings demonstrate that perceived value functions as the central psychological mechanism translating residential attributes into behavioral intention. Among the four examined attributes, environmental sustainability and residential comfort emerge as dominant value drivers, exerting both direct and value-mediated effects on purchase intention. In contrast, space utilization and intelligence degree show weaker and primarily indirect influences, suggesting that their impact depends on successful value translation rather than standalone appeal. The results indicate that consumers evaluate fourth-generation residences through an integrative cost–benefit appraisal, with experiential well-being and sustainability-related benefits forming the core foundations of adoption decisions. By clarifying the relative importance of bundled residential attributes and identifying perceived value as the key conversion pathway, the study contributes to theory development in housing innovation research while

offering guidance for strategic positioning in emerging sustainable residential markets.

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