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

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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.

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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