

DETERMINANTS OF RESIDENTIAL SATISFACTION IN VIETNAM'S EMERGING URBAN AREAS

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Abstract

This study assessed the factors affecting residents' satisfaction in the Gia Lam Urban Area (Vinhomes Ocean Park), Hanoi city, a typical satellite urban model in Vietnam's rapid urbanization. Data from 175 households were analyzed using EFA, multiple regression, and Importance-Performance Matrix (IPMA). Five groups of factors were identified: location (VT), technical infrastructure (HTKT), social infrastructure (HTXH), design-operation (TKVH), and environment-utilities (MTTB), which together explained 69.6% of the variation in satisfaction levels. The results showed that HTKT is highly important but has low performance and needs to be prioritized for improvement; XHXH and TKVH have high performance and need to be maintained stably; MTTB has outstanding performance; while VT is highly rated in terms of performance but has a relatively low level of importance. These findings expanded the theoretical framework of resident satisfaction in the context of urban transformation and provided practical guidance for sustainable urban planning, investment, and governance. The study recommended future longitudinal surveys to track changes in satisfaction levels over time.

Keywords: residential satisfaction; condominium; sustainable urban development; importance-performance matrix analysis; Vietnam.

1. INTRODUCTION

Housing has long been regarded as a cornerstone of social welfare and a key indicator of a nation's development (Idrus & Ho, 2008). As a fundamental component of living standards, housing not only provides shelter, safety, and privacy but also contributes to health, human development, and community

stability (Balestra & Sultan, 2013). Ensuring adequate, high-quality housing for all social groups is essential for maintaining social cohesion and achieving sustainable national development.

In the context of rapid global urbanization, housing has become an increasingly urgent issue, particularly in developing countries. Urbanization, defined as the growing proportion of populations residing in urban areas, has driven economic expansion, spatial growth, and rising demand for infrastructure, public services, and livable spaces (Shang et al., 2018). In Vietnam, the urbanization rate increased from 29.6% in 2009 to 42.5% in 2023, with an average annual growth rate of approximately 1% (General Statistics Office of Vietnam, 2023). While this transformation has stimulated investment and improved education, healthcare, and public services, it has also intensified land scarcity and housing costs, thereby widening disparities in housing accessibility.

As urban land becomes increasingly constrained, apartments have emerged as the predominant housing form in major cities such as Hanoi and Ho Chi Minh City. However, Vietnam's Price-to-Income Ratio (PIR) ranks among the highest in Southeast Asia, far exceeding those of Thailand, Indonesia, or the Philippines. According to Numbeo, the average price per square meter in city centers is approximately VND 80,479,456, compared to VND 44,169,532 in suburban areas; the average PIR reaches 28.17%, rising to 31.1% in Ho Chi Minh City and 30.1% in Hanoi (Numbeo, 2024). Such figures indicate significant financial pressure on homebuyers, especially middle- and low-income groups, and pose challenges to overall urban livability.

However, high housing prices do not necessarily translate into higher residential satisfaction, as financial value represents only one among many determinants. Previous studies have shown that construction quality, property management, environmental conditions, and social connectedness play more decisive roles in shaping residents' satisfaction (Milion et al., 2017; Rujibhong, 2023). Even residents living in high-priced apartments may report low satisfaction if these qualitative and social elements are lacking. Conversely, satisfaction tends to increase when residents experience safety, a pleasant living environment, efficient building management, and a sense of community (Aragonés et al., 2017; Thur & Khải, 2025). Understanding these multidimensional factors is vital for evaluating urban quality of life and guiding housing development toward social sustainability. Nevertheless, rapid urban expansion also poses challenges related to infrastructure capacity, service delivery, and community cohesion. These factors may critically influence residents' satisfaction and overall well-being, but have received limited empirical attention in Vietnam.

Globally, residential satisfaction, particularly in apartment living, has been recognized as a key indicator of urban quality of life and social sustainability (Aragonés et al., 2017). Studies conducted in the United States, China, and Malaysia consistently emphasize that physical, technical, managerial, and social

dimensions jointly shape residents' satisfaction (Awang et al., 2022; Chong et al., 2023; Ramli et al., 2021). Recent scholarship has adopted a multidimensional approach, integrating psychological well-being and environmental comfort into the analysis (Bian & Choi, 2023; Rujibhong, 2023; Saleem & Alchalabi, 2025). These studies highlight that housing satisfaction reflects not only physical adequacy but also the complex interplay between living environments, management efficiency, psychological perceptions, and community engagement.

In Vietnam, research on residential satisfaction in apartment contexts remains relatively limited. The condominium model has only expanded significantly over the past two decades, in parallel with rapid urbanization in Hanoi and Ho Chi Minh City. While several domestic studies have examined post-purchase behavior or customer satisfaction, most remain narrow in scope, focusing on inner-city areas and lacking a comprehensive theoretical framework that integrates physical, technical, managerial, and psychological aspects (Giang, 2023; Hien & Vinh, 2023; Thu & Khai, 2025; Tuan, 2025). Consequently, empirical evidence on residential satisfaction in newly developed urban zones, such as peri-urban projects like Gia Lam, remains scarce.

Although housing satisfaction has been widely examined in global and regional contexts, existing studies have focused mainly on developed urban centers or isolated housing attributes. Limited empirical research has examined the combined effects of physical infrastructure, housing design, management quality, and environmental conditions in newly developed urban districts in Vietnam, which differ markedly from traditional city centers in terms of planning patterns, governance, and resident composition. This study aims to provide a comprehensive understanding of residential satisfaction in emerging Vietnamese urban environments through a cross-sectional survey and quantitative analysis. It contributes to the literature in three main ways: (i) situating housing satisfaction within the context of peri-urban transformation, (ii) integrating physical and institutional dimensions into a unified analytical framework, (iii) providing policy-relevant insights for sustainable urban development and management.

2. LITERATURE REVIEW

2.1. *Concept and theoretical background*

Residential satisfaction has long been recognized as a multidimensional construct reflecting the degree to which the residential environment meets residents' expectations and needs (Amérigo & Aragonés, 1997). It represents both a cognitive evaluation: judging physical quality, accessibility, and service adequacy, and an affective response, reflecting residents' emotional attachment, sense of identity, and belonging to place. This dual nature aligns with the cognitive-affective model of satisfaction, which posits that individuals continuously compare their perceived living environment ("what is") with their desired standards ("what ought to be") (Li & Wu, 2013).

Maslow's Hierarchy of Needs Theory (1943) provides the motivational foundation for understanding residential satisfaction. Housing fulfills multiple layers of human needs, ranging from physiological and safety requirements to higher-order needs such as social belonging, esteem, and self-actualization. Meanwhile, Place Attachment Theory emphasizes how emotional bonds, social interaction, and neighborhood identity reinforce subjective well-being and strengthen satisfaction with the living environment (Inalhan et al., 2021). Together, these perspectives suggest that residential satisfaction arises not only from physical adequacy but also from the social and psychological quality of residential life.

Building on these theoretical foundations, empirical studies have consistently emphasized the multifactorial nature of housing satisfaction. Balestra & Sultan (2013) and Idrus & Ho (2008) have identified housing as a key determinant of national well-being, public health, and social stability. High-quality housing does more than provide physical shelter; it promotes child development, supports mental health, and contributes to social sustainability. As a result, housing satisfaction has become a measurable indicator of housing quality and sustainable urban development, serving as an important complement to economic indicators such as house prices (Sepawie et al., 2022). Since individual housing prices cannot capture factors such as safety, accessibility, and community amenities, integrating satisfaction measures enables a more comprehensive assessment of people-centered urban development.

Recent empirical studies reinforce this multidimensional view of satisfaction levels, which are influenced by physical, technical, managerial, social, and environmental comfort (light, noise, greenery, ventilation) (Dahlan et al., 2024; Saleem & Alchalabi, 2025). Hui & Zheng (2010) highlighted building management and service quality as core determinants, while Abdullahi and Wan Abdul Aziz (2011) emphasized the importance of housing policy and developer performance. In Southeast Asia, studies by Sepawie et al. (2022) and Wang & Tan (2025) further confirmed that infrastructure reliability and community amenities directly shape residents' perceived quality of life and social cohesion. In Vietnam, Pham et al. (2023) and Phung et al. (2022) investigated post-purchase behavior and identified management quality and service reliability as key determinants of residents' overall satisfaction.

However, despite the growing body of international literature, research integrating these diverse determinants in newly developed peri-urban areas of Vietnam remains limited. Existing studies tend to focus on inner-city apartment complexes, ignoring emerging urban areas such as Gia Lam, where rapid urbanization, developing infrastructure, and changing social structures interact more dynamically. To address this gap, the present study develops a comprehensive theoretical framework that integrates psychological, social, and technical aspects of satisfaction, examining how location, infrastructure,

management, and environmental factors collectively determine apartment-owner satisfaction in the Gia Lam Urban Area, Hanoi.

2.2. Determinants of residential satisfaction

Residential satisfaction is shaped by the interaction of many factors, including spatial, infrastructural, social, management, and environmental aspects. Based on previous studies and the context of rapid urbanization in Vietnam, this study identifies the main groups of determinants as follows.

Location: Location remains one of the most consistent predictors of resident satisfaction. Proximity to workplaces, administrative services, cultural and recreational centers, and public transportation enhances daily convenience, reduces commuting stress, and promotes social engagement (Phung et al., 2022; Saleem & Alchalabi, 2025). In rapidly growing urban suburbs such as Gia Lam, accessibility is not only about mobility but also about urban equity, shaping residents' access to opportunities, social interactions, and essential services. This study operationalizes location through four indicators: (i) distance to workplaces, (ii) accessibility to cultural and recreational facilities, (iii) proximity to administrative agencies, and (iv) accessibility to public transportation.

Technical Infrastructure: Provides the functional backbone of residential environments, ensuring the delivery of utilities and physical connectivity. Studies in Malaysia and Indonesia indicate that infrastructure reliability, such as power, water, transportation, and telecommunication systems, directly influences satisfaction (Dahlan et al., 2024; Saleem & Alchalabi, 2025). Infrastructure breakdowns, frequent service disruptions, or poor road quality can significantly reduce residents' trust in urban management (Awang et al., 2022). The present framework evaluates four core components: transportation networks, water supply, electricity systems, and telecommunications services. These reflect the foundational physical dimension of satisfaction, corresponding to Maslow's lower-level needs (safety and physiological).

Social Infrastructure: Social infrastructure encompasses community-oriented public services: education, healthcare, commerce, parks, and recreational spaces, that sustain social interaction and wellbeing. Saleem & Alchalabi (2025) found that access to these amenities fosters community cohesion and enhances urban livability. The availability of schools, healthcare facilities, and leisure spaces supports both functional and social dimensions of satisfaction. This study includes six observed variables: education facilities, healthcare centers, commercial and service spaces, green parks, cultural and entertainment amenities, and sports or playground areas. These facilities fulfill both functional and psychosocial needs, consistent with higher tiers of Maslow's hierarchy.

Housing Design: Housing design plays a vital role in determining comfort, aesthetics, and functionality. Alonso & Jacoby (2023) and Saleem & Alchalabi (2025) emphasized that spatial layout and design quality

affect privacy, usability, and identity formation within the home. Good design promotes residents' sense of pride and attachment to their living environment. The present study assesses seven components: total apartment area, number of bedrooms and bathrooms, and the area of living, dining, kitchen, and sanitary spaces. These variables represent the spatial efficiency and ergonomics that influence satisfaction at both physical and emotional levels.

Facilities: Housing facilities denote the quality and adequacy of in-unit installations and technical systems, such as ventilation, sanitation, electrical, and safety equipment. According to Balestra & Sultan (2013), well-maintained facilities enhance comfort, safety, and perceived quality of life. Rujibhong (2023) also linked environmental comfort and indoor air quality to residents' psychological well-being. The five facilities assessed include electrical systems, sanitary equipment, kitchen installations, fire protection systems, and ventilation/air conditioning. These directly influence perceived functionality and safety.

Social Environment: The social environment refers to the quality of social interaction, neighborhood cohesion, and perceived safety. Based on the Place Attachment Theory of Inalhan et al. (2021), community trust and participation foster emotional bonds that translate into greater satisfaction. Phung et al. (2022), Pimchan & Darawong (2024), and Saleem & Alchalabi (2025) further confirmed that supportive neighborhood relations mediate the effects of physical conditions on satisfaction and well-being. This dimension is measured through three components: residents' educational and cultural level, community relations, and neighborhood security.

Building Management and Operation: Building management ensures the sustainable operation and maintenance of residential properties. Effective management not only maintains physical assets but also nurtures residents' trust and sense of stability. Dahlan et al. (2024) identified facility management efficiency as the strongest determinant of satisfaction in high-density housing, while Phung et al. (2022) demonstrated that after-sales services and transparent regulations strongly influence satisfaction and loyalty in Vietnam's condominium market. This study measures management through four indicators: maintenance quality, environmental hygiene, clarity of internal regulations, and service fee fairness. These represent the managerial and governance dimension of satisfaction, connecting residents' trust with institutional performance.

2.3. *Conceptual Framework and Hypotheses*

Integrating theoretical and empirical insights, this study proposes an integrated conceptual model linking seven groups of factors to Residential Satisfaction (RS): Location (VT); Technical Infrastructure (HTKT); Social Infrastructure (HTXH); Housing Design (TK); Housing Facilities (TB); Social Environment (MT); Building Management and Operation (QLVH) (Figure 1). Each factor is hypothesized to have a positive, direct effect on residents' satisfaction. The model encapsulates both objective attributes (physical and

infrastructural quality) and subjective dimensions (social relations and managerial trust), consistent with the cognitive-affective model (Amérigo & Aragones, 1997) and Place Attachment Theory (Inalhan et al., 2021).

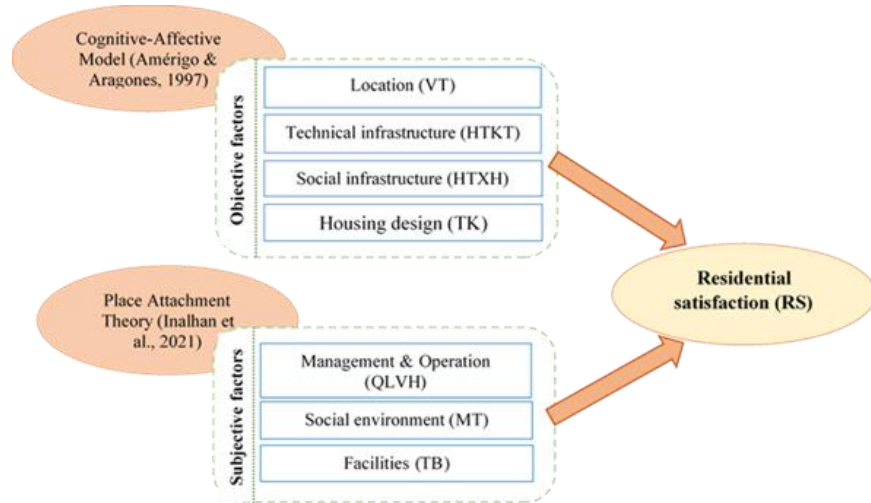


FIGURE 1 -CONCEPTUAL FRAMEWORK OF DETERMINANTS OF RESIDENTIAL SATISFACTION IN GIA LAM URBAN AREA

This integrated framework extends classical housing satisfaction theories by incorporating managerial and social dimensions particularly relevant to high-rise condominium living in emerging economies (Amérigo & Aragones, 1997). By synthesizing insights from Maslow’s hierarchy of needs, Place Attachment Theory, and empirical models from Dahlan et al. (2024), Phung et al. (2022), and Saleem & Alchalabi (2025), the study conceptualizes residential satisfaction as a multi-layered, context-dependent construct that bridges physical adequacy with social and institutional quality.

Empirically validating this model in Gia Lam Urban Area will provide new evidence for how residents in Vietnam’s new urban developments experience and evaluate their living environment, offering both theoretical advancement for international scholarship and policy relevance for sustainable urban housing governance.

3. METHODOLOGY

3.1. Research design and data collection

The study used a quantitative method, combining secondary and primary data to assess factors affecting the satisfaction levels of apartment owners in the Gia Lam Urban Area (Vinhomes Ocean Park), Hanoi. This area is a typical example of Hanoi’s strategy of developing satellite urban zones to expand Eastward. Characterized by modern planning and a high concentration of apartment units, Gia Lam aims not only to accommodate diverse income groups but also to enhance urban living quality, reduce inner-city pressure, and promote the city’s sustainable development agenda. Secondary data were collected from the Vincy

Project Management Board, Gia Lam Commune (former Gia Lam District), providing information on planning, technical infrastructure, and the population situation in the area. Primary data were collected through a structured questionnaire survey conducted from March to May 2024, with 175 valid respondents who are apartment owners currently living in the urban area. Random-intercept sampling was applied to ensure representativeness across different buildings, age groups, and income levels. Respondents were invited to participate directly in public spaces within the urban area, such as building lobbies, campuses, shopping malls, and entertainment areas. Participation in the survey is entirely voluntary and confidential, and the research purpose is clearly explained before implementation. Each questionnaire takes about 15 minutes to complete.

3.2. Sample size and respondent characteristics

A multi-stage sampling strategy was implemented in Gia Lam's new urban area using the official resident register from the building management board and local authorities. Residential blocks were selected for spatial coverage, then households were randomly sampled within each block; refusals/unavailable cases were replaced by adjacent households on the register, with substitutions recorded. The survey obtained 175 valid questionnaires (87.5%, 175/200). Data passed completeness checks, and demographic comparisons with population records suggested no meaningful non-response bias. Given the cross-sectional, single-site design, generalization should be cautious. The sample size is adequate for EFA and regression: 175 cases meet the 5:1 rule for 35 variables (Hair et al., 1998). Respondents largely reflect Hanoi's new urban residents, mainly middle-class, well-educated, and with stable incomes (Table 1).

TABLE 1 - DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS (N = 175)

Characteristic	Category	Percentage (%)
Gender	Male	48.0
	Female	52.0
Age	Under 30	28.6
	31-40	42.3
	Above 40	29.1
Education	Under-graduated	15.4
	Graduated	54.9
	Above-graduated	29.7
Monthly household income	Less than 20 million (VND)	17.7
	20-40 million (VND)	48.6
	Greater than 40 million (VND)	33.7
Duration of residence in an urban area	Less than 2 years	37.1
	2-4 years	43.4
	Above 4 years	19.5

Source: Own processing

3.3. Constructing scales and survey tools

The questionnaire was developed based on a theoretical synthesis of previous studies on resident satisfaction and consultation with five experts in real estate and urban management (Dahlan et al., 2024; Phùng et al., 2022; Tam et al., 2024). The final scale consists of 35 observed variables, divided into seven main groups of factors reflecting aspects affecting the satisfaction of apartment residents, including: (i) location; (ii) technical infrastructure; (iii) social infrastructure; (iv) apartment design; (v) housing equipment; (vi) social environment; and (vii) building management and operation (Table 2).

TABLE 2 - FACTORS AFFECTING THE SATISFACTION OF APARTMENT OWNERS

Factor	Symbol	Factor	Symbol
I. Location		18. Number of bedrooms	TK2
1. Distance to workplace	VT1	19. Number of bathrooms	TK3
2. Distance to cultural, sports, entertainment, and shopping centers	VT2	20. Area of bedroom	TK4
3. Distance to administrative offices	VT3	21. Area of dining room	TK5
4. Distance to bus station	VT4	22. Area of kitchen	TK6
II. Technical infrastructure		23. Area of bathroom	TK7
5. Transport system	HTKT1	V. Facilities	
6. Water supply	HTKT2	24. Electrical equipment	TB1
7. Power supply	HTKT3	25. Sanitary equipment	TB2
8. Telecommunication system	HTKT4	26. Kitchen equipment	TB3
9. Public lighting	HTKT5	27. Fire protection equipment	TB4
10. Collection and treatment of wastewater and solid waste	HTKT6	28. Ventilation and air-conditioning system	TB5
III. Social infrastructure		VI. Social environment	
11. Educational facilities	HTXH1	29. Educational level of residents	MT1
12. Healthcare facilities	HTXH2	30. Society relations	MT2
13. Commercial and service facilities	HTXH3	31. Security	MT3
14. Parks and green spaces	HTXH4	VII. Building management&operation	
15. Cultural and entertainment facilities	HTXH5	32. Management and maintenance	VH1
16. Ports and recreational areas	HTXH6	33. Environmental sanitation	VH2
IV. Housing design		34. Building regulations and internal rules	VH3
17. Area	TK1	35. Service charges	VH4

Specifically, residential Satisfaction (RS) was operationalized as a composite construct derived from multiple items capturing residents' overall evaluation of their living environment. These items reflect both cognitive and affective dimensions of satisfaction. The composite score was calculated as the mean of the items, ensuring internal consistency and construct validity. Respondents were asked to rate statements such as: (i) overall satisfaction with their current living environment; (ii) the extent to which the housing conditions meet their expectations; (iii) their satisfaction with daily living experience in the urban area; and (iv) their willingness to continue living in or recommend the area to others. All variables were

measured using a 5-point Likert scale, with ratings ranging from 1 ("very dissatisfied") to 5 ("very satisfied"). This scale is widely used in urban sociological research and allows quantifying people's subjective perceptions of the material and non-material elements of their living space.

3.4. *Data analysis*

Data were analyzed in SPSS 20.0. Scale reliability was first assessed using Cronbach's alpha; items were retained if α ranged from 0.60 to 0.95 and corrected item-total correlations exceeded 0.30 (Hair et al., 1998). Exploratory factor analysis (EFA) was then conducted to identify latent factor structures, using standard criteria: factor loadings > 0.50 , KMO between 0.50 and 1.00, a significant Bartlett's test (Sig. < 0.05), eigenvalues ≥ 1.00 , and total variance explained $> 50\%$. Finally, multivariate linear regression was employed to estimate the effects of extracted factors on overall resident satisfaction. Multicollinearity was assessed via variance inflation factors (VIF < 5.0), supporting model stability.

3.5. *Importance-Performance Matrix analysis (IPMA)*

The study proposes applying the Importance-Performance Matrix Analysis (IPMA) (Martilla & James, 1977) to set urban management priorities by comparing each factor's impact on overall satisfaction (importance) with its current level (performance). Importance is captured by standardized regression coefficients (β) from the multiple regression model, while each factor's mean survey score measures performance. Factors are mapped on a two-dimensional matrix (importance: Y-axis; performance: X-axis) using the grand means as the crosshair, forming four quadrants: (I) "Concentrate here" (high importance-low performance), (II) "Keep up the good work" (high-high), (III) "Low priority" (low-low), and (IV) "Possible overkill" (low importance-high performance), where resources may be reallocated. This visualization clarifies which factors require policy or managerial attention.

4. RESULTS

4.1. *Status of condominium development in the Gia Lam urban area*

Gia Lam Urban Area covers about 420 ha and accommodates roughly 89,500 residents. The development includes villas and townhouses (up to 5 stories), high-rise apartments (25-38 stories), a 45-story office building, an 11-story hospital, a regulating lake of over 55 ha, VinUni, an inter-level school system (kindergarten to high school), and public parking facilities. The apartment stock comprises 31 buildings (25-34 stories) concentrated in three sub-areas: Rubi (Zenpark), Sapphire 1 (S1), and Sapphire 2 (S2). Unit sizes range from 27 to 98 m², serving diverse household needs. Zenpark includes four premium towers (31-32 stories) with 2,802 units; Sapphire 1 has 11 buildings with 6,234 units; and Sapphire 2 has 16 buildings with 10,115 units. By the end of 2023, Gia Lam urban area had completed and handed over 18,712 of 19,151 apartments to customers, accounting for 97.7% of the total number of

apartments built (Table 3). Gia Lam urban area has a comprehensive infrastructure system, modernly designed, with many utilities that contribute to the satisfaction of apartment owners.

TABLE 3 - NUMBER OF APARTMENTS IN GIA LAM URBAN AREA

Building	Number of apartments	Number of apartments transferred	Number of occupied apartments	Number of residents
Rubi (Zenpark)	2.802	2.454	2.182	8.728
Sapphire 1	6.234	6.167	5.307	21.228
Sapphire 2	10.115	10.091	9.036	36.144
Total	19.151	18.712	16.525	66.100

Source: Gia Lam urban area Management Board, 2023.

With relatively complete infrastructure and extensive amenities, Gia Lam's apartment development supports Hanoi's urban expansion and satellite-city strategy. As inner-city land becomes scarce, eastern gateway projects such as Gia Lam help meet rising housing demand while facilitating planned population redistribution from the center to peri-urban areas. High-density apartment development also improves land-use efficiency and enables more coordinated technical and social infrastructure, contributing to urban modernization, enhanced quality of life, and local investment attraction. Moreover, this development aligns with Hanoi's planning orientation by easing pressure on inner-city infrastructure and the environment through decentralization.

4.2. Reliability analysis and Exploratory factor analysis

Cronbach's alpha values in Table 4 ranged from 0.721 to 0.832 (>0.70), confirming good internal consistency. Most items had corrected item-total correlations >0.30 , indicating adequate contributions to their constructs. However, the item "collection and treatment of wastewater and solid waste" showed a correlation of less than 0.30, suggesting weak alignment with the scale (possibly due to conceptual mismatch or varied perceptions). To protect reliability and avoid bias in subsequent analyses (EFA), this item was removed.

Similarly, the measurement items were adapted from established studies on residential satisfaction and subjective well-being, ensuring content validity and contextual relevance. The internal consistency of the RS construct was assessed using Cronbach's alpha, with results exceeding the recommended threshold of 0.70, confirming acceptable reliability.

As shown in Table 5, the KMO value was 0.869 (>0.5), indicating strong sampling adequacy for factor analysis. Bartlett's test was significant (Sig. = 0.000, $p < 0.05$), confirming that the correlation matrix is not an identity matrix and that the variables are sufficiently correlated to proceed with exploratory factor analysis.

TABLE 4 - RESULTS OF RELIABILITY ANALYSIS

Factor	Corrected Item-Total Correlation	Factor	Total variable correlation
VT (Cronbach's Alpha = 0.756)		TK (Cronbach's Alpha = 0.788)	
VT1	0.616	TK1	0.794
VT2	0.360	TK2	0.787
VT3	0.407	TK3	0.766
VT4	0.395	TK4	0.805
HTKT (Cronbach's Alpha = 0.776)		TK5	
HTKT1	0.468	TK6	0.678
HTKT2	0.456	TK7	0.619
HTKT3	0.521	TB (Cronbach's Alpha = 0.811)	
HTKT4	0.616	TB1	0.445
HTKT5	0.575	TB2	0.764
HTKT6	0.141	TB3	0.534
HTXH (Cronbach's Alpha = 0.832)		TB4	
HTXH1	0.612	TB5	0.320
HTXH2	0.500	MT (Cronbach's Alpha = 0.721)	
HTXH3	0.757	MT1	0.335
HTXH4	0.608	MT2	0.528
HTXH5	0.703	MT3	0.433
HTXH6	0.683	VH (Cronbach's Alpha = 0.732)	
		VH1	0.583
		VH2	0.540
		VH3	0.575
		VH4	0.343

Source: Own elaboration

TABLE 5 - KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.869
Bartlett's Test of Sphericity	Approx. Chi-Square	6,010.379
	df	595
	Sig.	0.000

Source: Own elaboration

Table 6 shows that the extracted factors explain 71.42% of the total variance, exceeding the 50% benchmark and indicating a well-fitting EFA solution. This result suggests that the identified factors capture most of the variation in apartment-owner satisfaction, demonstrating strong explanatory power and robust measurement of the key dimensions of resident satisfaction.

TABLE 6 - VARIANCE EXPLAINED

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	% Cumulative	Total	% of Variance	% of Cumulative	Total	% of Variance	% of Cumulative
1	13.030	37.228	37.228	13.030	37.228	37.228	6.931	19.804	19.804
2	4.639	13.255	50.482	4.639	13.255	50.482	6.457	18.449	38.253
3	2.987	8.536	59.018	2.987	8.536	59.018	5.625	16.070	54.323
4	2.794	7.983	67.001	2.794	7.983	67.001	3.217	9.191	63.514
5	1.547	4.421	71.422	1.547	4.421	71.422	2.768	7.908	71.422
...						
34	.013	.038	100.000						

Extraction Method: Principal Component Analysis

Source: Own elaboration

The EFA results reduce the initially proposed seven constructs to five factors. Notably, housing design (TK), facilities (TB), and building management and operation (VH) converge into a single factor labeled “design and operation” (TKVH), supported by strong loadings and no significant cross-loadings, indicating substantial shared variance. Similarly, a second merged factor combines in-unit technical amenities with social-environmental attributes, labeled “environment and technical amenities” (MTTB) as shown in Table 7. This pattern suggests that respondents perceive these elements as part of a broader, integrated evaluation of their living environment. All loadings exceeded 0.5, indicating strong associations between observed variables and their underlying factors. No item showed problematic cross-loadings across multiple factors, supporting apparent factor distinctiveness. Overall, the EFA results confirm both convergent and discriminant validity, indicating a reliable and appropriate measurement model.

TABLE 7. SUMMARY OF FACTORS AND OBSERVED VARIABLES AFTER EXTRACTION

Factor	Components
Location (VT)	VT1, VT2, VT3, VT4
Technical infrastructure (HTKT)	HTKT1, HTKT2, HTKT3, HTKT4, HTKT5
Social infrastructure (HTXH)	HTXH1, HTXH2, HTXH3, HTXH4, HTXH5, HTXH6
Design and operation (TKVH)	TK1, TK2, TK3, TK4, TK5, TK6, TK7, TB1, TB2, TB3, VH1, VH2, VH3, VH4
Environment and facilities outside of the apartment (MTTB)	TB4, TB5, MT1, MT2, MT3

Source: Own elaboration

4.3. Assessing the impact level of factors on the satisfaction

As reported in Table 8, the regression model shows strong explanatory power (adjusted R² = 0.696), indicating that the predictors account for 69.6% of the variation in satisfaction, with the remaining 30.4% attributable to factors outside the model and random error.

TABLE 8 - COEFFICIENTS^a

Model	Unstandardized Coefficients B	Standardized Coefficients Beta	Sig.	Collinearity Statistics		Impact ratio	Order impact
				Tolerance	VIF		
(Constant)	121.621		0.000				
VT	13.713	0.540	0.000	0.866	1.065	25.15	2
HTKT	14.127	0.556	0.000	0.829	1.059	25.90	1
HTXH	12.293	0.484	0.000	0.708	1.028	22.54	3
TKVH	6.460	0.254	0.000	0.754	1.109	11.83	5
MTTB	7.942	0.313	0.000	0.712	1.103	14.58	4
Sig.F = 0.000						Adjusted R ² = 0.696	
R ² = 0.699 ^a						Durbin-Watson = 1.868	
a. Predictors: (Constant), VT, HTKT, HTXH, TKVH, MTTB.							
b. Dependent Variable: RS.							

The overall model is statistically significant (ANOVA Sig. = 0.000). The Durbin-Watson statistic is 1.868 (within the 1-3 range), suggesting no autocorrelation (White, 1992). All VIF values are below 2, indicating no multicollinearity. All coefficients are positive, implying that higher levels of each factor are associated

with higher satisfaction. Based on standardized coefficients, technical infrastructure (HTKT) has the most substantial effect (25.90%), followed by location (VT, 25.15%), social infrastructure (HTXH, 22.54%), and environment-utilities (MTTB, 14.58%). Design-operation (TKVH) shows the smallest impact (11.83%). The model to assess the impact level of factors on the satisfaction of apartment owners in Gia Lam urban area is determined as follows: $RS = 0.54*VT+0.556*HTKT+0.484*HTXH+0.254*TKVH+0.313*MTTB$ (1)

4.4. Identification of priority quadrants through IPMA

Cut-off points for importance and performance were set at the grand means, following prior IPA applications in urban housing studies (Putri et al., 2024). The mean importance ($\bar{Y} = 0.08$) and mean performance ($\bar{X} = 49.54$) served as the crosshair, separating the matrix into four quadrants: (I) "Concentrate here" (high importance-low performance), (II) "Keep up the good work" (high-high), (III) "Low priority" (low-low), and (IV) "Possible overkill" (low importance-high performance). As shown in Figure 2, technical infrastructure (HTKT) is positioned in Quadrant I, indicating high importance but weaker performance. Residents consider core utilities and internal services (electricity, water, internal transport, parking) essential, yet note issues such as low water pressure and occasional peak-hour outages; thus, HTKT should be prioritized for improvement. Social infrastructure (HTXH) and design-operation (TKVH) fall in Quadrant II, meaning they are essential and perform well, and should be maintained through consistent service quality, transparent management, and regular maintenance. Environment-utilities (MTTB) shows strong performance but only moderate importance, suggesting routine monitoring rather than short-term investment expansion. Overall, IPMA supports targeted resource allocation, prioritizing HTKT while sustaining well-performing areas, to improve resident satisfaction and promote sustainable development in Hanoi's new urban areas.

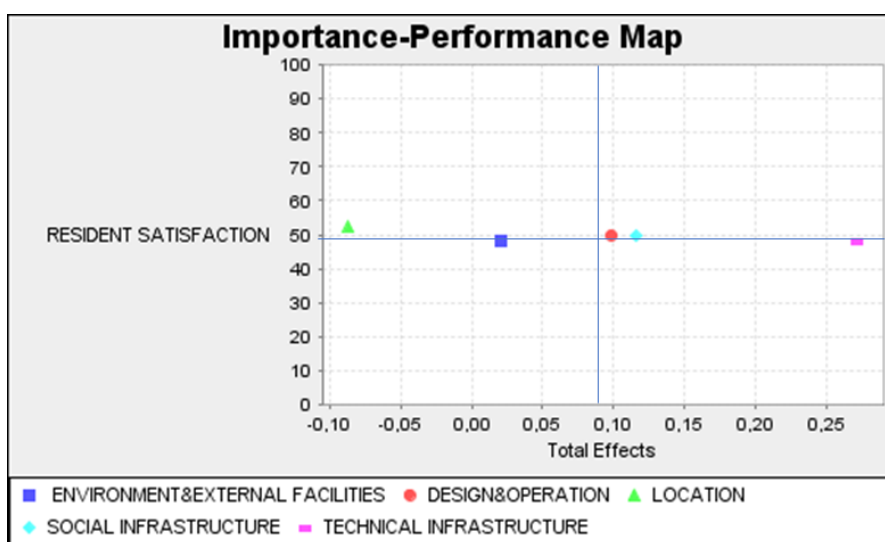


FIGURE 2 - IMPORTANCE - PERFORMANCE MAP

5. DISCUSSIONS AND IMPLICATIONS

Reducing seven theoretical constructs to five empirical factors provides important insight into how residents perceive their living environments in emerging urban contexts. The merging of housing design, facilities, and building management into a single “design and operation” factor reflects their interdependence and the integrated delivery of these components by a single developer in master-planned projects such as Gia Lam. Consequently, residents tend to evaluate them holistically as a unified “developer quality” dimension. A similar pattern is observed in the factor combining technical amenities and social-environmental attributes, where safety-related facilities and community conditions are perceived as part of a broader “living environment quality”. In high-density settings, daily experiences of safety, comfort, and social interaction are closely intertwined, leading to integrated rather than discrete evaluations. These findings suggest that, in transitional urban environments, the boundaries between physical design, technical infrastructure, and social environment are less distinct than assumed in conventional models. Instead, residential satisfaction reflects context-dependent, integrated perceptions shaped by how housing systems are delivered and experienced in practice.

Building on these findings, the quantitative results further clarify the relative importance and performance of the identified factors. The five factor groups, including location (VT), technical infrastructure (HTKT), social infrastructure (HTXH), design and operation (TKVH), and external environment and facilities (MTTB), together explain 69.6% of the variance in residents' satisfaction. Among them, technical infrastructure exerts the strongest influence (25.9%), followed by location (25.15%), social infrastructure (22.54%), external environment (14.58%), and design-operation (11.83%). The Importance-Performance Matrix Analysis (IPMA) further categorizes these factors into four strategic quadrants: technical infrastructure (HTKT) falls into Quadrant I (high importance - low performance); social infrastructure (HTXH) and design-operation (TKVH) belong to Quadrant II (high importance - high performance); external environment and facilities (MTTB) are placed in Quadrant III (moderate importance - high performance); and location (VT) lies in Quadrant IV (low importance - high performance). This multidimensional distribution provides a coherent framework for interpreting the empirical relationships and identifying policy priorities in emerging urban contexts.

5.1. *Technical infrastructure*

Technical infrastructure plays a fundamental role in the formation, operation, and sustainable development of urban areas. According to Fardoust et al. (2010), the level of investment in technical infrastructure is closely correlated with the quality of urban development, especially the ability to access basic services and the sustainability of the living environment. In the context of rapid urbanization in Hanoi, the quality and synchronization of technical infrastructure are increasingly becoming key factors

determining the use value and economic value of land. Research results in the Gia Lam urban area show that the group of technical infrastructure (HTKT) factors has the greatest impact on apartment owners' satisfaction, accounting for 25.9% of the regression model's explanatory power. Criteria such as internal traffic, communication, and public lighting are rated by the majority of residents at "very satisfied" and "satisfied", reflecting the results of synchronous investment in technical systems. However, electricity and water supply still recorded dissatisfaction rates of 6.43% and 21%, respectively, due to local power outages and low water pressure during peak hours.

In reality, a housing project is only effective when the technical system is properly invested in, conveniently connected, and operates stably. Vĩnh & Thảo (2025) affirmed that technical infrastructure plays a leading role in the planning and development of urban space, as it not only regulates accessibility but also limits population density and the area's long-term development potential. When infrastructure is not invested appropriately, even if the project has a good location or modern design, it is still difficult to attract residents and investors.

In addition to economic value, technical infrastructure factors also directly affect the quality of daily life. Systems such as electricity, water, internal traffic, waste collection, elevators, and fire safety are essential conditions to ensure living conditions. Research by Tuấn (2025) in Ho Chi Minh City shows that "technical infrastructure management" is one of the three factors that most significantly affect apartment residents' satisfaction. The results in Gia Lam also show similar findings: residents consider the stability, safety, and responsiveness of technical systems as direct measures of quality of life. These findings echo the IPMA outcome, which places technical infrastructure in Quadrant I (high importance, low performance). This underscores the need for immediate action: prioritized investment, regular maintenance, and the adoption of smart, resilient technologies to improve system stability and long-term sustainability. Consistent with UN-Habitat (2022), adaptive infrastructure such as renewable energy systems and sustainable wastewater treatment should be integrated into urban design to enhance resilience and reduce environmental risks.

5.2. Location

Location is a fundamental determinant of residential satisfaction, influencing accessibility, mobility, and perceived convenience. The regression results indicate that location ranks second in explanatory power (25.15%), emphasizing its critical role in shaping residents' overall evaluation of living conditions. Empirically, accessibility to main roads, public transport, and employment hubs is among the most valued criteria. However, despite Gia Lam's strategic position as Hanoi's eastern gateway, residents report that basic accessibility and commuting convenience have already been achieved, leading to a relative decline in the perceived importance of location.

The IPMA places location in Quadrant IV (low importance - high performance), suggesting that this factor performs strongly but contributes marginally to additional improvements in satisfaction. This “over-performance” pattern reflects a saturation effect often observed in maturing urban areas, where locational advantages become less decisive once core mobility needs are fulfilled. Consequently, further investments in location-based marketing or premium zoning may yield diminishing returns. Policy efforts should instead prioritize maintaining current connectivity levels and redirecting resources to underperforming yet critical sectors, particularly technical infrastructure and management quality, to enhance overall liveability and equity across districts.

5.3. *Social infrastructure*

Social infrastructure (HTXH) is a central element in the development of urban living space, including education, health care, trade and services, green parks, and cultural and sports institutions. The regression results show that this group of factors has the third-highest impact level (22.54%) and is classified in Quadrant II (high importance, high performance) in the IPMA matrix. This indicates that while residents recognize its significance, performance levels are generally satisfactory and should be maintained. Parks, sports facilities, and commercial centers were rated positively; however, the shortage of standard public schools and healthcare institutions remains a major shortcoming. Over 60% of residents perceived limited access to affordable medical care, forcing them to travel long distances to the city center.

This finding is similar to the results of Bian & Choi (2023) in China, where new urban areas often experience faster housing construction than social service investment, creating an “amenity gap” that reduces residents’ satisfaction. Research by Dahlan et al. (2024) in Malaysia also emphasizes that balanced social development, including green spaces, public services, and community activities, is a core factor in fostering a sense of attachment and security, thereby increasing long-term satisfaction. In this context, synchronizing the development of social and technical infrastructure becomes a prerequisite. When health, education, cultural, and entertainment services are not invested in proportionately, residents’ satisfaction is unlikely to be stable, no matter how modern the physical infrastructure is.

5.4. *Apartment design, equipment, and operation management*

The design and operation (TKVH) group of factors had the lowest impact (11.83%), but most clearly reflected the gap between residents’ expectations and actual experiences. The indicators for the kitchen and bathroom areas were rated lowest, with “very dissatisfied” rates of 15% and 15.71%, respectively. The overall apartment area received a more positive assessment (only 8.57% dissatisfied), but was still below the design standards for mid-range apartments in similar urban areas in Southeast Asia.

In terms of equipment, residents were generally satisfied with the electrical system, kitchen equipment, and air conditioning - ventilation, but expressed concerns about fire safety, with more than 60% of respondents dissatisfied with the quality of equipment and fire exits. This result is consistent with the conclusion of Hui & Zheng (2010) that safety and technical maintenance factors directly affect the satisfaction and trust of urban residents.

Operational management services also have the lowest satisfaction scores, especially in the two criteria of service fees and environmental sanitation, with average scores of 1.93 and 2.47, respectively. Residents report that the high service fees do not match the quality, and that waste collection and landscaping have not met the initial commitment. Dust and noise pollution from neighboring construction work are also contributing to the decrease in satisfaction levels. Despite these shortcomings, the IPMA results position TKVH in Quadrant II (high importance, high performance), suggesting that, while overall performance is satisfactory, continuous monitoring is essential to prevent decline.

These issues are similar to Xi's (2021) findings, emphasizing that operational capacity and transparency in cost management are decisive factors in maintaining stable satisfaction among apartment residents. Therefore, in new urban areas such as Gia Lam, improving the management model with residents' participation, ensuring transparency in service fees, and enhancing periodic maintenance and fire safety standards are urgent requirements to improve the quality of life and community trust.

5.5. Environment outside the apartment and Facilities

The external environment and facilities (MTTB) factor, comprising open spaces, green areas, and nearby amenities, contributes 14.58% to overall satisfaction and falls under Quadrant III (moderate importance, high performance). Residents rated recreational and commercial facilities highly, noting improved accessibility to green and public spaces. This outcome indicates effective implementation of environmental and landscape planning, consistent with UN-Habitat (2022) recommendations for livable cities.

However, while current performance is strong, environmental maintenance and landscape management require periodic review to ensure sustainability. Excessive investment in over-performing areas could divert resources from more critical needs, such as infrastructure improvement. The results, therefore, suggest that the focus should remain on preserving existing standards and monitoring ecosystem balance, rather than major short-term expansion.

5.6. *Theoretical and Practical Implications*

The findings from this study contribute both theoretically and practically to urban housing development, especially in emerging urban areas in Vietnam, where rapid urbanization and cultural specificity often exceed the ability to test global theoretical frameworks.

Theoretically, this study extends classical frameworks such as the Housing Satisfaction Model, Place Attachment Theory, and Subjective Well-Being Theory to the transitional urban context of Vietnam (Amérigo & Aragonés, 1997; Inalhan et al., 2021). This study empirically confirms that housing satisfaction is a multidimensional construct shaped by socio-technical systems, governance transparency, and cultural adaptation. Residents highly value community cohesion and neighborhood support networks, which are closely linked to collectivist values. For example, 72% of survey respondents reported relying on their neighborhood networks for assistance with daily needs such as emergency childcare or food sharing, suggesting that social relationships are a necessary condition for long-term satisfaction, not just a byproduct of social infrastructure. Furthermore, alignment with Subjective Well-Being Theory suggests that transparent building management, including clear maintenance budgets and resident feedback mechanisms, reduces uncertainty and shapes perceived satisfaction, a factor often overlooked in quantitative residential studies. In contrast to Turner (1976) deficit-oriented view of housing, which sees satisfaction as merely material adequacy, this study asserts that post-basic urban environments require comprehensive social and governance engagement.

In practice, the findings provide actionable insights for policymakers, planners, and developers, in line with UN-Habitat (2022) and SDG 11. The IPMA framework clarifies priority actions: (i) allocate targeted investment to underperforming but critical areas such as technical infrastructure (Quadrant I); (ii) maintain and monitor well-performing domains including social infrastructure and building management (Quadrant II); (iii) sustain environmental performance efficiently (Quadrant III); and (iv) avoid excessive emphasis on location-based advantages (Quadrant IV). Institutionalizing participatory governance, transparent maintenance budgeting, and inclusive community programs, consistent with some previous studies, will further reinforce social cohesion and urban resilience (Barrie et al., 2023; Chen et al., 2022).

Overall, the study shows that resident satisfaction in Vietnam's new urban areas is not a static result of physical space expansion, but a dynamic product of a balance of socio-technical infrastructure, culturally based community mechanisms, and transparent governance. The theoretical contributions refine global frameworks for developing country contexts, while the practical strategies provide a roadmap for stakeholders to put residents' quality of life at the center. Further research could extend this foundation through longitudinal surveys to track changes in satisfaction levels as infrastructure ages, or cross-country

comparisons to test generalizability, thereby ensuring that urban development in Southeast Asia is evidence-based and contextualized.

6. CONCLUSIONS

This study examines residents' satisfaction in new urban areas in Hanoi, using Gia Lam as a representative case of suburban urbanization in Vietnam. Through multiple regression analysis and Importance-Performance Matrix Analysis (IPMA), it identifies five major factor groups: technical infrastructure, social infrastructure, apartment design and operation, location, and external environment and amenities, which together explain 69.6% of the variation in satisfaction. In the meantime, technical infrastructure emerges as the most influential but least efficient factor, indicating an urgent need for reinvestment, upgrading, and more sustainable management. The findings confirm that residents' satisfaction is multidimensional, shaped not only by physical conditions and location but also by service reliability, social accessibility, environmental quality, and management transparency. IPMA further highlights technical infrastructure as the top priority for improvement, while social infrastructure and design-operation should be maintained as strengths.

Theoretically, the study contributes to refining models of residential satisfaction in the context of urban transition in middle-income countries. It shows that satisfaction and subjective well-being are influenced not only by physical attributes but also by interactions among infrastructure systems, community trust, participatory governance, and socio-cultural dynamics. Thus, it extends the frameworks of Residential Satisfaction and Place Attachment. In practice, the findings have important implications for planners, policymakers, and investors in improving urban governance and resource allocation. Development strategies should prioritize weak yet high-value technical infrastructure while maintaining the quality of social services, operational management, and environmental amenities. Transparent and participatory apartment management mechanisms are also essential for strengthening community trust and reducing governance risks.

However, the study is limited by its cross-sectional design, which only allows correlational rather than causal interpretation. Future research should adopt longitudinal approaches to capture changes in residents' satisfaction over time and comparative studies across regions or Southeast Asian countries to test the model's wider applicability. Overall, the study confirms that sustainable urban development in Vietnam depends not only on physical expansion but also on the integration of infrastructure modernization, social cohesion, and transparent governance, with residents' quality of life at the center of urban policy and planning.

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