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Indicators of Local Housing Attractiveness in Davao City: A Multidimensional Analysis

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Abstract
This study employed a quantitative descriptive research design utilizing Multidimensional Analysis to determine the indicators of local housing attractiveness of first-time homebuyers. A total of 377 respondents were chosen using a stratified sampling technique. Results were analyzed using mean and standard deviation, and Multidimensional Scaling (MDS) was used to identify the latent dimensions underlying homebuyer preferences. Based on the findings, first-time homebuyers of local housing in Davao City found it highly essential to choose housing in safe areas, such as flood-free locations, landslide-free zones, and structurally resilient housing built from durable materials with earthquake-resistant structures. Meanwhile, the homebuyers found it less essential for local housing to be compliant with superstitions and have swimming pools. The Multidimensional Scaling (MDS) analysis yielded a stress value of 1,459,618.78, indicating a high level of distortion in the two-dimensional representation. This suggests that while the model provides a general visualization of the data structure, it may not fully capture the true relationships among the variables. The data revealed two principal latent domains: Essential Livability and Sustainable Opportunity. The findings provide a basis for local real estate to adapt to current housing trends and improve project planning.

Keywords: business real estate, local housing attractiveness, essential livability, sustainable opportunity, Multidimensional Scaling (MDS) analysis

1. Introduction

Homeownership is widely recognized as a key contributor to socioeconomic stability and upward mobility. Beyond shelter, it serves as an economic and social asset that helps households build wealth, improve financial security, and enhance overall well-being. Recent studies highlight that homeownership supports long-term economic stability and better quality of life, emphasizing its role as both a financial investment and a social resource for families [25], [14]. However, despite the benefits of homeownership, many households, particularly first-time homebuyers, still face significant barriers in accessing suitable housing. Rising property prices, affordability constraints, and income limitations make it increasingly difficult for potential buyers to enter the housing market, often forcing them to delay homeownership or consider less suitable alternatives [2], [33].

Housing challenges are particularly evident in the Philippines, where renting remains more common, especially among young professionals and foreign residents who prioritize proximity to workplaces. Limited affordable housing near job centers and restricted access to mortgages contribute to persistent

housing stress among urban households [32], [4]. In cities like Davao, however, limited research exists on how first-time homebuyers perceive housing attractiveness. Understanding these indicators is important, as they influence homeownership decisions and help developers and policymakers design housing that better meets buyers' needs.

Housing attractiveness is a multidimensional concept that influences the preferences and decisions of homebuyers. Research indicates that housing attractiveness is closely tied to essential livability, which encompasses the fundamental conditions that ensure comfort, security, and access to opportunities. Recent studies highlight that proximity to workplaces, schools, healthcare facilities, and commercial services strongly affects residential choice, particularly for first-time homebuyers who prioritize accessibility and daily convenience [23], [11]. Environmental quality, neighborhood amenities, and access to green spaces also contribute to livability, enhancing physical and mental well-being and fostering community stability [26], [27], [36]. Disaster preparedness and climate-resilient construction are increasingly recognized as crucial elements in creating durable and appealing homes [17]. In the Philippines, research on housing stress suggests that many households struggle to access safe, affordable homes near employment opportunities, resulting in compromises in safety and accessibility [4]. Moreover, international studies highlight that housing attractiveness is also shaped by sustainable opportunities, which encompass environmental quality, economic proximity, and community value. Access to employment centers, transportation networks, and community facilities strengthens the sustainability of housing decisions by supporting economic mobility and urban integration [34], [12]. Green infrastructure and mixed-use neighborhoods are further related to higher life satisfaction and sustainable urban living [26], [27], [12]. However, in the Philippines, evidence remains limited but growing. Recent studies have shown that access to urban green spaces and community parks supports physical and mental well-being, particularly during the COVID-19 pandemic [36]. Ballesteros et al. (2022) note that many households experience "housing stress" due to the scarcity of affordable homes near jobs and services, underscoring the importance of location and community facilities in supporting ownership [4].

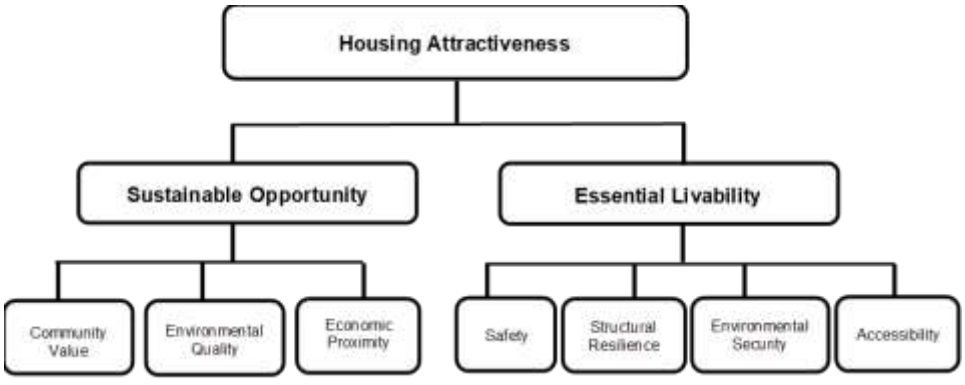
This study is guided by three key theoretical perspectives: Expectancy Theory, Consumer Choice Theory, and Lifestyle Theory, all of which provide insights into how individuals evaluate and select homes. Expectancy Theory [44] posits that individuals make decisions based on the outcomes they expect to achieve, which are shaped by the expectancy, instrumentality, and valence of the outcomes. In housing, this means that buyers are motivated to purchase when they feel a home will provide valued outcomes such as security, stability, comfort, or long-term investment [40]. For example, a family may choose a house in a gated subdivision because they expect it to offer greater safety and stability for their children. Meanwhile, Consumer Choice Theory and Lifestyle Theory add economic and social dimensions to housing decisions. Consumer Choice Theory explains that individuals allocate limited resources to maximize satisfaction, considering factors such as price, location, size, and neighborhood characteristics [43]. For instance, a buyer may prefer a smaller condominium near work rather than a larger home in a distant suburb due to convenience. In contrast, Lifestyle Theory, highlights that housing choices reflect individuals' values, routines, and priorities [22]. A young professional may prioritize a modern condo near business districts. At the same time, a family may prefer suburban homes that align with their family-oriented lifestyle. These examples highlight that housing attractiveness is not only an economic or structural evaluation but also a reflection of personal lifestyles and social values.

Building on these perspectives, this study conceptualizes housing attractiveness as a multidimensional construct, defined as the perceived desirability of residential properties based on how well they meet immediate living needs and long-term expectations of value and sustainability [38]. As shown in Figure 1, the framework highlights two major dimensions: Essential Livability, adapted from Lim (2020), which includes safety from crime and hazards, structural resilience, environmental security, accessibility to schools, workplaces, and services, and affordability [22]; and Sustainable Opportunity, adapted from Mouratidis (2021), which emphasizes long-term considerations such as community value, environmental quality, and economic proximity to employment and business centers [31]. Together, these dimensions provide an integrated lens for analyzing housing attractiveness in Davao City, recognizing that housing decisions are shaped by both practical needs and expectations of long-term stability.

Furthermore, safety remains a top priority, with a focus on protection from crime and natural hazards. Closely related to this is structural resilience, which emphasizes the durability and disaster readiness of housing units, particularly in high-risk areas [17], environmental security plays a crucial role, as exposure to flooding, pollution, and other ecological risks affects both health and property values [28]. Lastly, accessibility, referring to the ease of reaching workplaces, schools, healthcare facilities, and transportation, contributes significantly to convenience and overall satisfaction [20]. Alongside these, community value strengthens neighborhood ties, fostering social cohesion and a sense of belonging among residents [30]. Equally important, environmental quality, including clean air, green spaces, and a pleasant environment, enhances both livability and housing appeal [31]. Finally, economic proximity refers to the convenience of being near job markets and commercial hubs, which influences affordability, commuting efficiency, and long-term property [21]. Given the multidimensional nature of these factors, Multidimensional Scaling (MDS) was used as an analytical tool to simplify complex relationships among variables into a two-dimensional space, enabling clearer visualization and evaluation of housing attractiveness in Davao City [39].

This conceptual framework guided the study's application of Multidimensional Scaling (MDS) to identify the underlying indicators of housing attractiveness empirically.

Figure 1. Conceptual Framework of the Study



Building on this framework, it is essential to acknowledge that while housing affordability, preferences, and quality of life have been extensively studied, the specific concept of local housing attractiveness remains underexplored in the Philippine context. Existing research tends to emphasize affordability, infrastructure, or accessibility, yet rarely captures residential attractiveness as the combined influence of environmental, structural, social, and economic factors [38]. This gap is particularly evident in Davao

City, a rapidly growing urban hub in the Visayas–Mindanao corridor, where housing demand has increased due to young professionals and returning Overseas Filipino Workers [24], [32]. Despite this growth, most empirical housing studies remain concentrated in Metro Manila, overlooking Davao's unique housing dynamics. Addressing this gap is urgent and timely, as localized insights into housing attractiveness can guide developers, policymakers, and financial institutions in aligning residential projects with buyer preferences and advancing sustainable housing development in the city [4].

Therefore, the primary objective in this research was to examine the local housing attractiveness in Davao City using Multidimensional Analysis. Two specific objectives guided this study: first, to determine the index of the local housing attractiveness indicators, and second, to validate the representation of multiple correlated domains reflected by the observed indicators, which account for the distinct but interrelated constructs. The researcher undertook a series of preparatory procedures before employing Multidimensional Scaling (MDS) analysis to achieve the objectives effectively. Key informant interviews with selected real estate professionals were carried out to identify and validate factors influencing housing attractiveness from both professional and community perspectives. The insights obtained were then synthesized with findings from existing literature to establish a comprehensive set of seventy-five indicators representing the diverse dimensions of housing attractiveness. This process enabled the identification of patterns and relationships among the indicators, ultimately providing an index of local housing attractiveness in Davao City. These validated indicators served as the foundation for the multidimensional analysis.

Conducting this research would provide an evidence-based platform that is currently lacking in the Philippines. This research contributes to the global body of literature on housing preferences by providing empirical evidence on the multidimensional factors influencing housing attractiveness in a developing urban context. On a broader social level, the study promotes housing as a basic human need and a driver of community well-being, directly aligning with the United Nations Sustainable Development Goals (SDGs), particularly SDG 11: Sustainable Cities and Communities, and SDG 9: Industry, Innovation and Infrastructure. By advocating for housing development that reflects the actual preferences of first-time homebuyers, this research promotes resilient, inclusive, and sustainable urban growth. The findings of this study were particularly beneficial to the Department of Human Settlements and Urban Development (DHSUD), local government units, and housing developers, providing them with data-driven insights to guide the planning and implementation of more attractive, resilient, and buyer-centered housing projects. It encourages the adoption of participatory and market-responsive planning practices to enhance residential satisfaction and urban sustainability. Moreover, future researchers may draw upon the methodology, data analysis, and theoretical framework used in this study to enrich academic discourse and develop practical solutions to pressing housing challenges in similar urban contexts.

2. Method

The study surveyed 377 first-time homebuyers of local housing units in Davao City, selected for their direct experience in housing decisions and representing diverse socioeconomic backgrounds. The sample size was determined using Cochran's formula at a 95% confidence level and 5% margin of error [8] and meets the recommended requirement for Multidimensional Scaling (MDS) analysis of at least 100–200 observations [15]. A screening question ("Have you ever owned a house before?") was used to ensure that only qualified first-time homebuyers participated [35]. Stratified random sampling was employed to

ensure that respondents were proportionately represented across relevant subgroups, thereby enhancing the representativeness and generalizability of the findings [10], [13]. Furthermore, participants were required to be Filipino, at least 18 years old, earning an income, and first-time homebuyers. Individuals who had previously owned property, purchased multiple properties, had no plans to buy in Davao City, or could not provide informed consent were excluded. Moreover, this study was conducted in Davao City, the regional center of Region XI and serves as a hub for economic activity, governance, education, and real estate development. Its housing market has been recognized by Colliers Philippines (2022) as one of the most competitive in the Visayas–Mindanao corridor, making it a strategic location for examining indicators of local housing attractiveness [9].

A researcher-made questionnaire was used as the primary data collection tool. It consisted of two sections: the first gathered demographic and socioeconomic information (age, sex, civil status, education, income, and employment), while the second assessed indicators of housing attractiveness derived from previous studies [38], [5] and key informant interview with real estate professionals. The indicators were presented as statements representing variables influencing housing attractiveness and were subjected to expert validation. Revisions were made based on the experts' comments and recommendations to finalize the instrument. Respondents rated each item using a 4-point Likert scale based on its importance in their home purchase decision. The scale was as follows:

Range of Mean	**Verbal Interpretation**	**Descriptive Interpretation**
3.26 – 4.00	Very High	It indicates that the indicators of local housing attractiveness are highly essential.
2.51 – 3.25	High	It indicates that the indicators of local housing attractiveness are essential.
1.76 – 2.50	Low	It indicates that the indicators of local housing attractiveness are sometimes essential.
1.00 – 1.75	Very low	It indicates that the indicators of local housing attractiveness are not essential.

Cronbach's alpha was used to assess the internal consistency of the instrument, with values of 0.70 and above considered acceptable. The computed alpha of 0.956 for 75 items indicates excellent reliability, confirming the suitability of the instrument for Multidimensional Scaling (MDS) analysis.

This study employed a quantitative descriptive research design. It utilized Multidimensional Analysis to examine how first-time homebuyers in Davao City assess the attractiveness of local housing. Respondents were chosen through stratified sampling, and data were collected during the 2024–2025 academic year using a cross-sectional approach [7]. Descriptive statistics were employed to summarize observable trends and quantify buyer preferences [10], while Multidimensional Scaling (MDS) was used to condense 75 indicators into clusters and uncover latent dimensions of attractiveness [1].

Moreover, statistical treatments and analytical techniques were employed. For the first objective, descriptive statistics including weighted mean analysis, and standard deviation were used to determine the relative importance of indicators [10]. A four-point Likert scale served as the basis for interpreting the results and assessing the perceived importance of each indicator [18]. For the second objective, Multidimensional Scaling (MDS) was applied to map relationships and latent structures among the indicators [39]. Cronbach's alpha further verified the internal consistency of the grouped domains, ensuring the reliability of the results [41].

3. Results and Discussion

Index of Local Housing Attractiveness Indicators

Gleaned in Table 1 is the index of indicators of local housing attractiveness. Most indicators were very high, described as highly essential, ranging from 3.26 to 4.00. Notably, 53 out of 75 indicators were rated very high by the respondents. Result suggests that first-time homebuyers place substantial importance on safety, resilience, and structural soundness when making housing decisions. This consistent emphasis on safety and structural integrity reflects a pragmatic and risk-aware approach, where respondents prioritize housing that minimizes environmental risks and ensures long-term stability. Moreover, findings also suggest that first-time homebuyers also attach high importance to affordability, accessibility, and lifestyle-oriented features that enhance daily living.

The result clearly shows that respondents place significant importance on safety and the structural soundness of housing. The preference for areas free from flooding, landslides, and seismic vulnerability points to a practical concern for risk reduction and long-term stability. The high ratings of durable construction materials and earthquake-resistant features also reflect a strong inclination toward homes that can endure environmental stress and offer physical protection. These priorities may stem from local experiences with natural hazards and a growing concern for resilient living conditions in rural and urban settings.

Table 1. Index of Local Housing Attractiveness

Factors	Mean	Standard Deviation	Interpretation
Safe area	3.96	0.195	Very Essential
Flood free	3.939	0.239	Very Essential
Stable water	3.92	0.271	Very Essential
Landslide free	3.912	0.379	Very Essential
Durable materials	3.886	0.386	Very Essential
Crime free	3.865	0.412	Very Essential
Earthquake resistant	3.865	0.342	Very Essential
Quality structure	3.849	0.394	Very Essential
24/7 security	3.846	0.434	Very Essential
Payment capacity	3.828	0.398	Very Essential
Stable power	3.822	0.403	Very Essential
Affordable price	3.82	0.384	Very Essential
No damage	3.817	0.45	Very Essential
Clean surroundings	3.79	0.462	Very Essential

Factors	Mean	Standard Deviation	Interpretation
Manageable payments	3.78	0.463	Very Essential
Low interest	3.775	0.472	Very Essential
Public transport	3.756	0.448	Very Essential
Low amortization	3.745	0.465	Very Essential
Street lighting	3.732	0.466	Very Essential
Good developer	3.727	0.491	Very Essential
Easy application	3.724	0.503	Very Essential
Non polluted	3.721	0.482	Very Essential
Fault free	3.721	0.582	Very Essential
Pag-IBIG financing	3.706	0.597	Very Essential
School access	3.565	0.615	Very Essential
Low price	3.69	0.522	Very Essential
Clean neighborhood	3.684	0.549	Very Essential
Hassle free	3.668	0.563	Very Essential
Market access	3.666	0.52	Very Essential
Concrete road	3.658	0.552	Very Essential
With firewall	3.65	0.564	Very Essential
Low downpayment	3.65	0.535	Very Essential
Natural environment	3.634	0.604	Very Essential
Quiet neighborhood	3.607	0.647	Very Essential
Spacious house	3.605	0.668	Very Essential
Ready occupancy	3.599	0.611	Very Essential
Proper ventilation	3.597	0.645	Very Essential
Near workplace	3.562	0.677	Very Essential
Gated house	3.541	0.675	Very Essential
Low equity	3.523	0.639	Very Essential
Low maintenance	3.504	0.66	Very Essential
Enough rooms	3.501	0.61	Very Essential
Parking space	3.496	0.699	Very Essential
Hospital access	3.451	0.642	Very Essential
With backyard	3.448	0.697	Very Essential
Attractive appearance	3.435	0.673	Very Essential
Good service	3.427	0.631	Very Essential
Appealing design	3.424	0.683	Very Essential
Non vatable	3.406	0.704	Very Essential
Church access	3.403	0.715	Very Essential
Spacious lot	3.369	0.843	Very Essential
Scenic view	3.342	0.793	Very Essential
Business center	3.271	0.765	Very Essential
Mall access	3.257	0.84	Essential
Appealing amenities	3.244	0.787	Essential

Factors	Mean	Standard Deviation	Interpretation
High ceiling	3.228	0.828	Essential
Near road	3.178	0.829	Essential
Enough bathrooms	3.149	0.749	Essential
Government access	3.13	0.789	Essential
Basketball court	3.045	1.098	Essential
Nature Park	3.021	0.889	Essential
Near entrance	2.989	0.771	Essential
Built-in cabinet	2.987	0.908	Essential
Neighbor presence	2.979	0.83	Essential
Desired number	2.942	1	Essential
Prestige area	2.881	0.949	Essential
Friend recommendation	2.838	0.914	Essential
Near relatives	2.822	0.911	Essential
Two floors	2.788	0.894	Essential
Police proximity	2.753	0.972	Essential
Constant ads	2.729	0.925	Essential
Community playground	2.7	1.057	Essential
Single story	2.589	1.183	Essential
Superstition compliant	2.379	0.986	Sometimes Essential
Swimming pool	2.361	1.034	Sometimes Essential

The findings support Biswas and Mukerji (2025), who emphasized that homebuyers value structural durability, safety, and access to essential amenities [6]. Their study revealed that features such as reliable infrastructure, convenient location, and thoughtful design have a significant impact on residential preferences. This information is relevant to ensuring that housing attributes and locational factors cater to the needs of homebuyers [29].

Furthermore, the findings support Hendriks and Opdyke (2020) who observed that in countries prone to earthquakes, homebuyers tend to prioritize structural resilience and safety features when selecting a residence [17]. This growing demand underscores a contemporary trend in homebuying, one that real estate developers should consider when planning and designing residential projects, especially since they are often better equipped than local builders to implement safer construction practices in earthquake-prone areas [42].

On the other hand, out of the 75 predetermined factors, 20 are considered as high described as essential. These findings indicate that while these features were still deemed essential, they were considered less critical compared to safety, disaster resilience, and structural integrity, showing that homebuyers prioritize basic security and stability over lifestyle-oriented attributes.

Evidently, the homeowners found it essential for housing attractiveness when it is near government services. This finding aligns with recent studies indicating that homeowners tend to prefer residential locations near essential public services and government-related establishments, as these contribute to perceived safety, accessibility, and overall convenience [28]. This finding is also supported by Mohanna and Alqahtany (2019), who suggest that homeowners tend to prefer detached duplexes over other types

of single-family housing [29]. This preference aligns with Kährik and Pastak's (2023) observation that young households increasingly favor private rental dwellings, reflecting a broader shift toward more spacious and flexible living arrangements [19]. It suggests a change in preferences from rentals to homeownership, and from single-story to detached duplexes, taking into account factors such as flooding and space requirements.

In contrast, lifestyle-oriented, aesthetic, and symbolic features such as superstition compliant and swimming pool were given relatively less emphasis, indicating that such attributes are viewed as supplementary rather than essential. This study shows that such beliefs have minimal impact on homeowners' decision-making, contrary to Hassan et al. (2021), who suggested that superstitious beliefs significantly influence housing preferences [16]. Hence, this implies that while Filipinos are highly tied to cultural and traditional superstitions, choosing a housing location based on attractiveness is less significant.

The findings indicate that respondents have subjective perceptions when evaluating the attractiveness of local housing. Amenities like swimming pools and promotional visibility are perceived as luxuries rather than necessities. At the same time, concerns rooted in superstition appear to have minimal influence on housing decisions. Similarly, design preferences like single-story layouts and proximity to police authorities are secondary considerations compared to safety from natural hazards and structural durability. It suggests a more practical and needs-based approach among residents, focusing on long-term safety, functionality, and resilience over lifestyle-oriented or cultural concerns.

Overall, the results reveal a clear pattern: practical features that contribute to safety, durability, hazard resilience, and financial feasibility are prioritized over aesthetic enhancements or symbolic considerations. It underscores the community's pragmatic view of housing, shaped by real-world risks and the necessity for secure and sustainable living conditions. Additionally, it provides relevant information, ensuring that current trends are taken into account in changing homebuyers' preferences and revolutionizing local real estate for residential lots.

Domains of Housing Attractiveness Indicators

To explore the underlying structure of these multidimensional indicators, Multidimensional Scaling (MDS) was employed. The analysis aimed to visualize the relational distances among the indicators and extract latent domains. Importantly, it seeks to classify the 75 indicators into dimensions based on statistical scaling. Through this approach, the study provides insights into the indicators of local housing attractiveness for homeowners in Davao City.

To provide a clear visual understanding of the clustered indicators, Table 2 presents the general factors and their corresponding factors.

Table 2. Clustered Indicators based on Reduced Dimensions

	General Factors
Dimension 1 – Sustainable Opportunity	• Environmental Quality • Economic Proximity • Community Value
Dimension 2 – Essential Livability	• Safety • Structural Resilience • Environmental Security

	• Accessibility

Evidently, the findings have classified the indicators into two dimensions: Dimension 1, Sustainable Opportunity, and Dimension 2, Essential Livability. Dimension 1 might be influenced by factors such as financial aspects (e.g., low equity, low down payment) and proximity to amenities (e.g., near workplace, mall access). Properties with high positive values in Dimension 1 might be more financially accessible or closer to amenities, which may be collectively interpreted as "Sustainable opportunity." While Dimension 2 might be influenced by safety and structural features (e.g., earthquake-resistant, durable materials) and environmental factors (e.g., clean surroundings, natural environment), and may therefore be summarized under the theme of "Essential Livability." Properties with high positive values in Dimension 2 might be safer or have better structural features.

Furthermore, Table 2.1 presents the results of the cluster analysis based on the Multidimensional Scaling (MDS) coordinates. Outliers like Data Point 2 might represent properties that are either exceptionally good or bad in certain aspects. The findings provide insights into the indicators of local housing attractiveness for homeowners in Davao City.

Table 2.1 Clustered Analysis indicating Coordinates of Reduced Dimensions

	Data Points				
	0	1	2	3	4
Dimension 1	-0.0836	8.5766	10.3199	-6.2275	0.04726
Dimension 2	-2.80465	2.609773	-16.226891	-7.149562	4.202240

Note: Values represent the spatial coordinates of each indicator in a two-dimensional configuration derived from Multidimensional Scaling (MDS).

The table presented above shows that Data Point 0, located at coordinates (-0.083616, -2.804651), is relatively close to the origin, suggesting that it represents a property or indicator with average characteristics across the various dimensions of housing attractiveness. In contrast, Data Point 1, situated at (8.576675, 2.609773), is positioned far from the origin, indicating it embodies a property with distinct features that may be perceived as either highly desirable or particularly undesirable.

Meanwhile, Data Point 2, located at (10.319858, -16.226891), appears as an outlier, exhibiting unique or extreme characteristics in comparison to the other items. Data Point 3, with coordinates (-6.227466, 7.149562), also lies far from the origin, implying that it, too, reflects a property with marked and potentially less favorable attributes. Data Point 4, located at (0.047260, 4.202240), is relatively near the origin yet distinct enough to suggest it holds moderately unique characteristics that differentiate it slightly from the average cluster.

To further understand the findings, Table 2.2 reveals the stress and fit indices of the MDS solution. The Stress and R-squared values are essential metrics in evaluating the quality of the Multidimensional Scaling (MDS) solution. The stress value obtained from the Multidimensional Scaling (MDS) analysis was 1,459,618.78. Stress is a measure of the discrepancy between the distances among points in the reduced two-dimensional MDS configuration and the original high-dimensional dissimilarities. Ideally, a lower stress value indicates a better fit, meaning that the MDS solution closely represents the original data. However, the relatively high stress value in this analysis suggests a substantial distortion in how the data is projected onto two dimensions. It implies that while the MDS plot provides a valid

approximation for visualizing complex data, it may not fully capture the authentic relationships among all the variables or data points.

Table 2.2 Stress and Fit Indices of the MDS Solution

Fit Index	Value
Stress	1459618.780
R-square	0.932

The high stress value obtained from the MDS analysis suggests that there are notable discrepancies between the distances among points in the two-dimensional configuration and the original dissimilarities in the dataset. It often occurs when complex, high-dimensional data is reduced to just two dimensions, which may not fully capture the nuanced relationships among all the variables. In this case, the complexity of the housing preference indicators, ranging from location and structural integrity to financial options, may contribute to this distortion.

However, despite the elevated stress value, the accompanying high R-squared value (0.93) indicates that the overall MDS solution still accounts for a substantial portion of the variance in the data. It means that while some specific relationships between factors may not be perfectly represented, the general structure and patterns among the data points are reasonably preserved. Therefore, the MDS plot remains a valuable tool for visualizing and interpreting the broad similarities and distinctions in housing attractiveness factors, even if not every individual pairing is precisely captured.

Moreover, the R-squared value obtained from the Multidimensional Scaling (MDS) analysis was approximately 0.932. This value represents the proportion of variance in the original dissimilarities that is accounted for by the two-dimensional MDS configuration. An R-squared value closer to 1 indicates a better fit, with more variance explained by the model. In this case, the high R-squared value demonstrates that approximately 93% of the variance in the data is effectively presented in the two-dimensional space. It indicates that, despite the high stress value, the MDS configuration still provides a strong and meaningful representation of the data's overall structure.

Consequently, a wide array of factors influences property preferences, including proximity to key amenities (e.g., schools, hospitals, malls), structural and environmental safety features (e.g., flood-free areas, earthquake resistance, security), and financial considerations (e.g., affordability, financing options). In the context of this multifaceted dataset, the high R-squared value (0.93) obtained from the Multidimensional Scaling (MDS) analysis is significant. It indicates that the two-dimensional MDS solution effectively captures about 93% of the variability in the original dissimilarity data. This high level of explained variance suggests that the MDS plot offers a reliable and interpretable visualization of how different properties or factors relate to one another in terms of perceived similarities and differences. Therefore, despite potential limitations (such as a relatively high stress value), the MDS configuration can be confidently used to examine patterns, clusters, and outliers among the factors that define local housing attractiveness.

Lastly, the stress and R-squared values provide essential insights into the quality of the MDS solution. While the high-stress value indicates some discrepancies, the high R-squared value suggests that the MDS solution still effectively captures most of the variability in the original data.

To understand the cluster analysis, Figure 2 presents the MDS plot which visually clusters the indicators based on similarity in respondents' perceptions. Indicators such as safety, affordability, and accessibility

clustered together, suggesting a latent domain of "Essential Livability", whereas environmental quality and proximity to jobs loaded on a separate domain labeled "Sustainable Opportunity."

Figure 2. Multidimensional (MDS) Configuration Plot

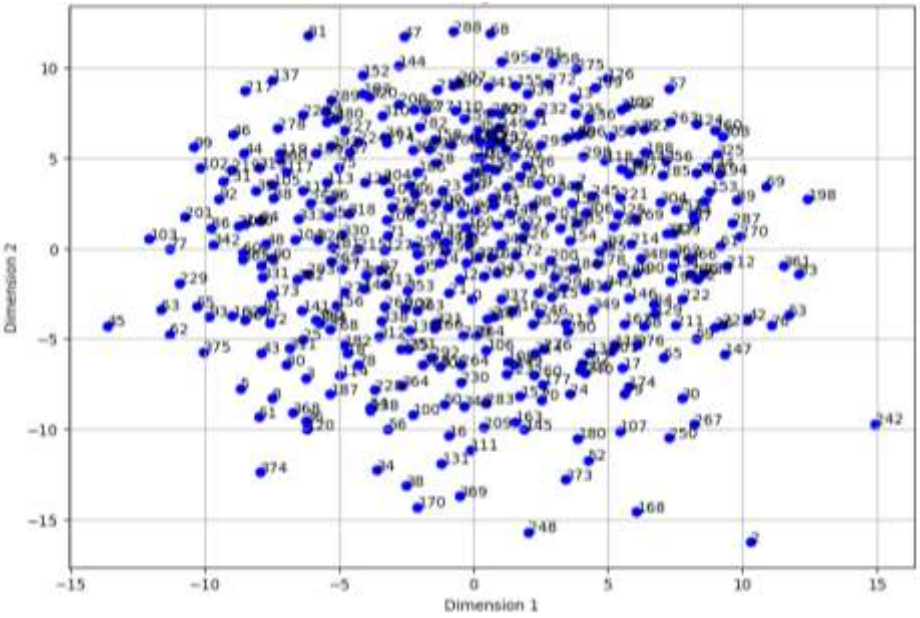


Figure 2 shows a Multidimensional Scaling (MDS) configuration plot which visualizes the relationships between numerous data points in a two-dimensional space. The plot is densely populated with over 300 points, each labeled with a number. The points are spread across both dimensions, with Dimension 1 on the x-axis ranging from approximately -15 to 15, and Dimension 2 on the y-axis ranging from about -15 to 12. There's a noticeable concentration of points in the central area of the plot, roughly between -5 and 5 on both axes, suggesting that many data points share similar characteristics. However, there are also several outliers scattered around the periphery of the plot, particularly in the corners, indicating some data points that are quite different from the central cluster. This visualization enables the identification of patterns, clusters, and outliers in what is likely a complex, high-dimensional dataset, which has been reduced to two dimensions for more straightforward interpretation.

Figure 3. Scree Plot Showing the Distribution of Eigenvalues Across Components

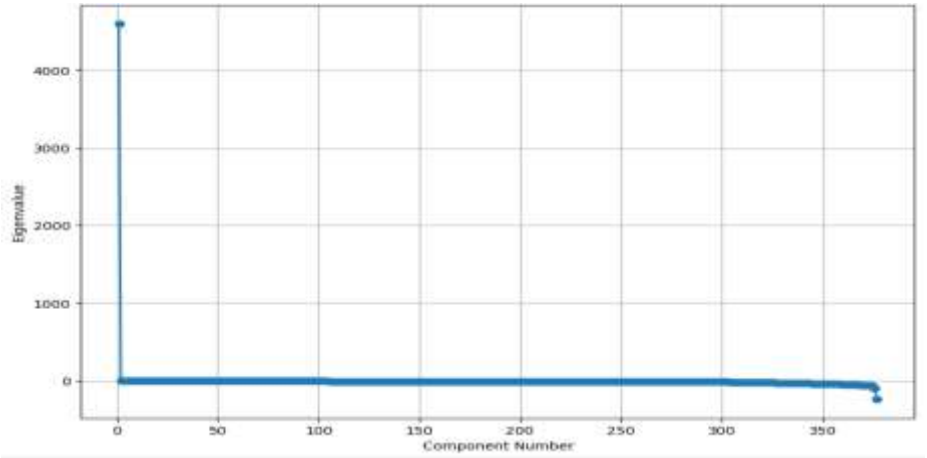
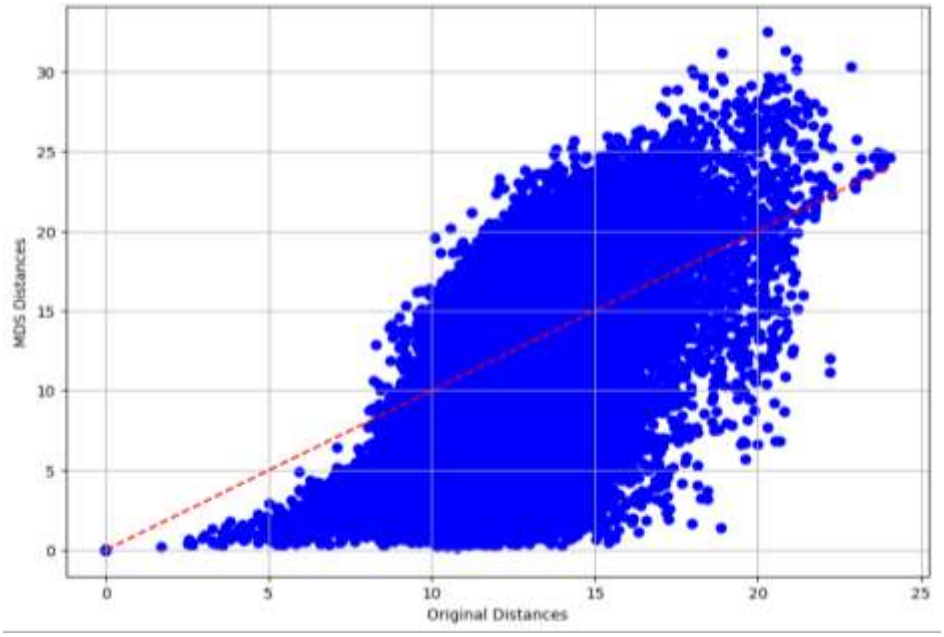


Figure 3 displays a scree plot, a commonly used tool in principal component analysis (PCA) or factor analysis, to determine the number of significant components or factors in a dataset. The x-axis represents the component number, ranging from 0 to about 350. At the same time, the y-axis shows the eigenvalue associated with each component. The plot exhibits a very steep drop from the first component to the second, with the first component having an exceptionally high eigenvalue of around 4500. After this dramatic initial drop, the curve quickly flattens out, with all subsequent components having much lower eigenvalues that are close to zero. This pattern, often referred to as an "elbow" shape, suggests that the first component explains a vast majority of the variance in the data. In contrast, the remaining components contribute relatively little additional explanatory power. Based on this scree plot, a researcher might conclude that a one-component or perhaps two-component solution could adequately represent the underlying structure of the data, as there is a clear break in the amount of variance explained after the first (or possibly second) component.

Figure 4. Shepard Diagram on MDS solution



Meanwhile, Figure 4 presents a Shepard diagram, which is used to assess the quality of a Multidimensional Scaling (MDS) solution. The x-axis represents the original distances between data points, while the y-axis shows the corresponding MDS distances. The blue dots represent pairs of points, and their positioning indicates how well the MDS solution preserves the original distances between them. The red dashed line appears to be a reference line, possibly representing a perfect correlation between original and MDS distances. The plot exhibits a strong positive correlation between the original and MDS distances, as indicated by the general upward trend of the points. However, there is some scatter around this trend, particularly at larger distances, indicating some discrepancies between the original and MDS-derived distances. The concentration of points at lower distances suggests that the MDS solution preserves shorter distances more accurately. Overall, this Shepard diagram indicates that the MDS solution provides a reasonably good representation of the original data structure, with some inevitable distortion, particularly for larger distances.

Figure 5. Residual Diagram for an MDS analysis

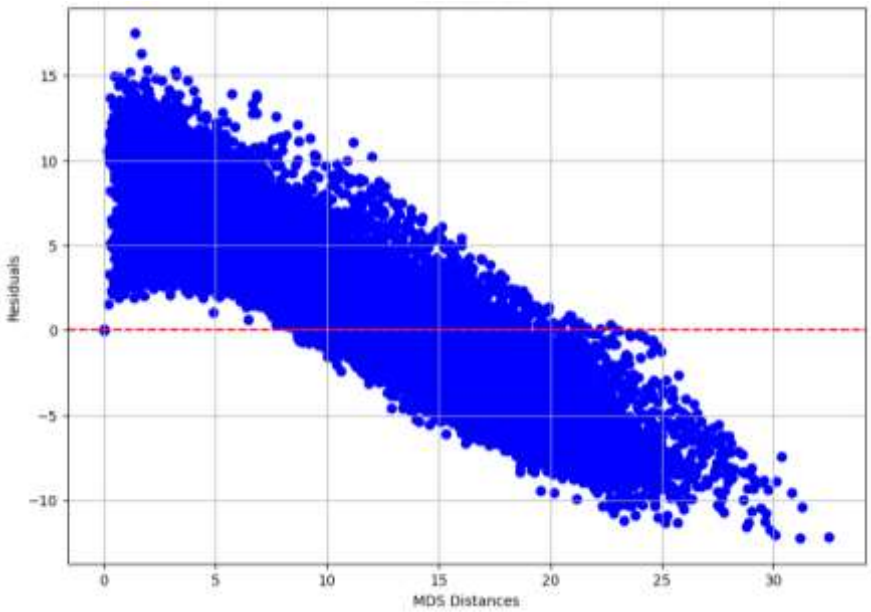


Figure 5 shows a residual plot for a Multidimensional Scaling (MDS) analysis. The x-axis represents the MDS distances, while the y-axis shows the residuals (differences between observed and predicted distances). The red dashed line at y = 0 means perfect prediction. The plot reveals a distinct pattern: residuals are largely positive for smaller MDS distances and become increasingly hostile for larger distances. This fan-shaped distribution indicates systematic bias in the MDS solution. Specifically, the MDS tends to overestimate short distances (resulting in positive residuals) and underestimate long distances (resulting in negative residuals). The spread of residuals is also greater for smaller distances, suggesting more variability in the accuracy of predictions for nearby points. This non-random pattern in the residuals indicates that the MDS solution, while capturing overall trends, does not perfectly represent the original data structure, particularly at the extremes of the distance range. The plot helps identify where the MDS model's predictions deviate most from the actual data, which could guide further refinement of the analysis or interpretation of results.

Based on the collective evidence from the MDS Configuration Plot, Scree Plot, Shepard Diagram, and Residual Plot, we can conclude that the MDS model results are moderately acceptable but not entirely robust. The Configuration Plot shows a reasonable spread of points, indicating differentiation among data points. The Scree Plot suggests that a minimal number of components (possibly just one or two) explain most of the variance, which is efficient but may oversimplify complex relationships. The Shepard Diagram shows a strong positive correlation between original and MDS distances, indicating that the overall structure is preserved. However, the Residual Plot reveals systematic bias, with overestimation of short distances and underestimation of long distances. This pattern in the residuals is a concern, as it indicates that the MDS solution does not uniformly represent the data across all distance scales. While the model captures broad trends and relationships in the data, these systematic discrepancies suggest that interpretations should be made cautiously, especially for extreme distances. The model may be statistically acceptable for general insights. Still, it lacks the robustness needed for highly precise or granular analyses. Therefore, refinement or alternative techniques are considered to address these limitations.

4. Conclusion and Recommendation

The findings of this study reveal that indicators of local housing attractiveness related to safety and structural resilience, including safe neighborhoods, flood-free and landslide-free locations, durable construction materials, and earthquake-resistant structures are very highly significant in housing choice. In contrast, symbolic and aesthetic features, such as the presence of swimming pools and superstition-related factors, were found to be less significant to respondents.

Using MDS, the data revealed two principal latent domains: Sustainable Opportunity and Essential Livability. Sustainable Opportunity capture features linked to proximity to economic hubs and environmental quality, while Essential Livability includes core priorities such as safety from physical and environmental hazards. Despite a high stress value, the MDS analysis maintained a high R-squared value (0.93), indicating a strong explanatory power of the two-dimensional model in representing the complex relationships among housing preferences. These findings highlight the multifaceted nature of housing attractiveness, encompassing physical structures, environmental safety, access to services, community features, and economic feasibility.

The findings support the adapted theory, the Expectancy Theory of Motivation, which posits that individuals are motivated by the perceived alignment between their needs and the expected outcomes of their decisions [40]. In this context, first-time homebuyers in Davao City prioritize essential features such as structural resilience, safety from environmental hazards, and long-term livability, reflecting their expectations of stability, protection, and value. Their low preference for symbolic or aesthetic features, such as swimming pools or superstition-related factors, suggests a pragmatic decision-making pattern based on functionality and benefit. The MDS results further reinforce this perspective, as the identified domains of Essential Livability and Sustainable Opportunity capture both the foundational safety expectations and the broader aspirations for economic and environmental sustainability. This behavioral pattern affirms that housing choices are driven by perceived gains tied to personal priorities, as explained by Expectancy Theory. The findings also align with Lifestyle Theory, as first-time homebuyers in Davao City prioritized safety, structural resilience, and environmental protection, reflecting lifestyle orientations centered on security, family well-being, and long-term stability rather than luxury or symbolic features. Similarly, the results support Consumer Choice Theory, as buyers, constrained by limited resources, engage in a utility-maximizing process, favoring essential attributes that provide the most incredible value and satisfaction, while deprioritizing less practical features. Together, these perspectives highlight that homebuyers' choices are both lifestyle-driven and rationally constrained, complementing the motivational lens of Expectancy Theory.

Given these findings, housing developers and planners are encouraged to prioritize the provision of safe, hazard-free environments and structurally resilient housing using durable and earthquake-resistant materials, as these remain the most critical considerations of homebuyers. In addition, government agencies such as the Department of Human Settlements and Urban Development (DHSUD), National Housing Authority (NHA), and local government units (LGUs) may develop strategic approaches, including home personalization, to accommodate homeowners' cultural beliefs and preferences.

While lifestyle amenities and symbolic attributes were found to be less essential, these features may still be strategically enhanced, rebranded, or selectively offered to niche markets to improve overall housing attractiveness. For instance, developers may emphasize lifestyle benefits and incorporate low-maintenance, energy-efficient systems for amenities such as swimming pools to increase their perceived value.

Policymakers and housing agencies may also utilize these findings as evidence-based guidance in strengthening housing programs that promote affordability, accessibility, and environmental security. In support of this, urban and regional planners, in collaboration with DHSUD and local housing boards, are encouraged to conduct regular market assessments and participatory planning initiatives to remain responsive to evolving housing demands and buyer preferences.

Furthermore, future researchers may replicate this study using Multidimensional Scaling (MDS) and explore the role of less-preferred features in shaping housing decisions to better understand changing consumer behavior. These efforts may contribute to the development of more responsive, community-aligned, and resilient housing projects, while also enriching the body of knowledge on urban housing preferences.

Finally, this study acknowledges certain limitations. The focus on homeowners in Davao City limits the generalizability of the findings to other regions. In addition, while the model provides meaningful general insights, it may lack the precision required for more detailed analyses. Hence, future studies are encouraged to expand the geographic scope to include the entire Region XI and to explore alternative analytical techniques for further refinement.

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