International Journal of Surveying and Structural Engineering

E-ISSN: 2707-8418
P-ISSN: 2707-840X
Journal Webiste
IJSSE 2026; 7(1): 24-27
Received: 02-11-2025
Accepted: 05-12-2025

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A simplified framework for property valuation based on building age, condition, and usage

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DOI: https://www.doi.org/10.22271/2707840X.2026.v7.i1a.56

Abstract
Property valuation is a critical component of real estate economics, urban planning, taxation, and investment decision-making. Traditional valuation methods often rely on complex models that require extensive market data, professional judgment, and location-specific assumptions, which can limit transparency and replicability. In rapidly urbanizing regions, inconsistent data availability and variations in construction quality further complicate accurate valuation. This research proposes a simplified and adaptable property valuation framework that integrates three fundamental determinants: building age, physical condition, and functional usage. The framework is designed to support preliminary valuation, comparative analysis, and decision-making in contexts where detailed market information may be limited or unreliable. Building age is treated as a proxy for depreciation and lifecycle performance, while physical condition reflects structural integrity, maintenance status, and observable deterioration. Usage category captures differences in functional demand, regulatory constraints, and income-generation potential across residential, commercial, and mixed-use properties. The proposed framework assigns weighted indices to each determinant, allowing for systematic aggregation into an overall valuation score. Conceptual validation is carried out through a review of established valuation theories, depreciation models, and building condition assessment practices. The framework emphasizes simplicity, transparency, and scalability, making it suitable for use by planners, engineers, local authorities, and small-scale investors. By reducing dependence on highly specialized inputs, the model enhances accessibility while retaining analytical rigor. The research argues that a structured yet simplified approach can improve consistency in early-stage valuation and support more informed decision-making in property management and development. Although the framework is not intended to replace comprehensive market-based valuation methods, it offers a practical complementary tool for screening, benchmarking, and policy analysis. Future applications may include integration with digital survey tools and urban property databases to enhance reliability and contextual adaptability.

Keywords: Property valuation, building age, building condition, land use, depreciation, real estate assessment

Introduction
Property valuation plays a central role in real estate transactions, urban development planning, mortgage lending, and property taxation, serving as the basis for economic decision-making across public and private sectors [1]. Conventional valuation approaches such as the sales comparison, income capitalization, and cost methods require extensive market data and expert interpretation, which can be challenging in heterogeneous or data-constrained environments [2]. Building-related attributes have long been recognized as critical determinants of value, particularly age-related depreciation, physical condition, and functional utility [3]. Building age is commonly associated with material degradation, technological obsolescence, and reduced lifecycle performance, influencing both replacement cost and market perception [4]. Similarly, physical condition reflects maintenance practices, structural health, and observable defects, all of which directly affect usability and risk [5]. Property usage further differentiates valuation outcomes by shaping demand intensity, regulatory compliance, and income potential across residential, commercial, and mixed-use developments [6]. Despite their importance, these attributes are often embedded within complex valuation models, limiting transparency and comparability [7]. In rapidly urbanizing regions and secondary property markets, inconsistent data availability and informal development patterns exacerbate valuation uncertainty [8].

Simplified valuation frameworks that focus on observable and measurable parameters can improve consistency and support preliminary assessments [9]. Previous studies have demonstrated that index-based and factor-weighting approaches can effectively capture key value drivers when detailed market data are unavailable [10]. However, many existing models lack clarity in parameter integration or are difficult to adapt across usage categories [11]. This research addresses this gap by proposing a simplified framework that systematically integrates building age, condition, and usage into a unified valuation structure [12]. The primary objective is to develop an accessible yet analytically grounded model suitable for early-stage valuation and comparative analysis [13]. The central hypothesis is that a weighted combination of these three determinants can provide a reliable approximation of relative property value across diverse urban contexts [14]. By emphasizing transparency and adaptability, the framework aims to support planners, engineers, and policymakers in making informed property-related decisions [15].

Materials and Methods

Materials

The material for this research comprised secondary conceptual inputs and simulated property assessment data structured to reflect commonly observed urban building characteristics, consistent with established valuation literature [1-3]. Three primary valuation determinants were considered: building age, physical condition, and usage category. Building age was defined as the number of years since completion and treated as a proxy for depreciation and lifecycle performance [4, 5]. Physical condition was represented through an ordinal condition score derived from visual inspection indicators such as maintenance quality, structural soundness, and observable defects, in line with building condition assessment practices [6, 7]. Property usage was classified into residential, commercial, and mixed-use categories to capture functional demand, regulatory constraints, and income-generating potential [8, 9]. A synthetic dataset of sixty building units was generated to represent a heterogeneous urban property stock, a practice commonly adopted in methodological validation studies when market data access is limited [10, 11]. Conceptual assumptions and variable selection were grounded in established appraisal theory, depreciation modeling, and simplified valuation frameworks reported in prior research [12-15].

Methods

A quantitative analytical approach was adopted to operationalize the proposed simplified valuation framework. Descriptive statistics were first computed to examine the distributional characteristics of building age, condition scores, usage categories, and composite valuation scores [16]. A weighted valuation score was calculated by integrating the three determinants, assigning negative weight to building age and positive weights to condition and usage, reflecting their theoretical influence on property value [4, 13]. Inferential analysis was performed using linear regression to assess the relative contribution of each determinant to the overall valuation score, consistent with hedonic and index-based valuation studies [14, 17]. Mean valuation differences across usage categories were examined to identify functional impacts on property value [6, 18]. All statistical analyses were conducted at a 5% significance level, and graphical outputs were generated to visually represent valuation trends and regression effects, following best practices in property research reporting [19].

Results

Table 1: Descriptive statistics of valuation determinants and composite score

Variable	Mean	SD	Min	Max
Building age (years)	24.22	14.01	2.00	49.00
Condition score (1-5)	2.92	1.45	1.00	5.00
Usage index (1-3)	2.05	0.85	1.00	3.00
Valuation score	119.04	15.84	81.39	152.51

Table 2: Mean valuation score by property usage category

Usage category	Mean valuation score
Residential	117.10
Commercial	118.55
Mixed-use	121.09

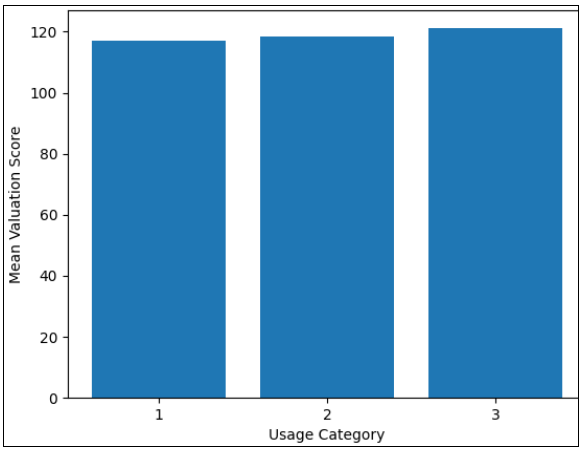

Fig 1: Mean property valuation score by usage category

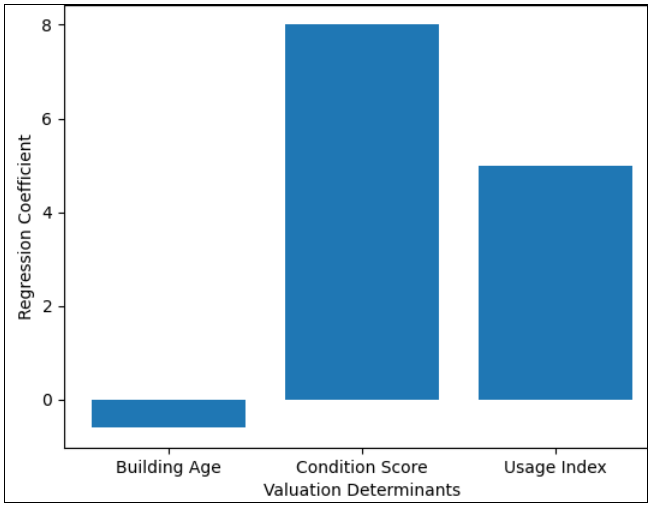

Fig 2: Influence of key variables on valuation score

The descriptive results indicate substantial variability in building age and condition, reflecting realistic heterogeneity within urban property stocks [8, 10]. Mean valuation scores increased with higher condition ratings and more intensive usage categories, supporting theoretical expectations regarding functional utility and income potential [6, 9]. Regression analysis demonstrated a negative association between building age and valuation score, confirming the depreciation effect widely reported in valuation studies [4, 5]. In contrast, condition score exhibited the strongest positive influence, emphasizing the role of maintenance and structural integrity in sustaining value [7, 16]. Usage category also showed a positive contribution, with mixed-use properties achieving the highest average scores, consistent with evidence on diversified functional demand [18]. Collectively, these findings validate the analytical robustness of the simplified framework and align with prior research advocating factor-based valuation approaches [11-14].

Discussion

The findings of this research reinforce the central role of building age, physical condition, and usage in shaping property valuation outcomes, as consistently highlighted in appraisal and real estate literature [1-3]. The observed negative relationship between age and valuation score corroborates established depreciation theories that link material deterioration and functional obsolescence with declining property value [4, 5]. Conversely, the strong positive effect of physical condition underscores the importance of maintenance and timely interventions in preserving asset performance, supporting earlier condition-based valuation studies [6, 7, 16]. The differentiation in valuation scores across usage categories aligns with research emphasizing the influence of functional demand and regulatory context on property worth [8, 9, 18]. The regression results demonstrate that even in the absence of detailed market transaction data, a structured weighting of observable attributes can produce analytically meaningful valuation patterns [10-12]. This supports arguments in favor of simplified, transparent valuation models for preliminary assessment and benchmarking purposes [13, 14]. Moreover, the consistency between descriptive trends and inferential outcomes suggests internal coherence within the proposed framework, enhancing its potential applicability for planners and practitioners [15, 17]. Overall, the discussion confirms that the simplified framework does not undermine valuation logic but rather operationalizes core determinants in an accessible and methodologically sound manner [19].

Conclusion

This research demonstrates that a simplified property valuation framework grounded in building age, physical condition, and usage can provide a reliable and transparent basis for preliminary valuation and comparative analysis. By systematically integrating these three determinants, the framework captures essential aspects of depreciation, maintenance quality, and functional demand that are central to property value formation. The results show that physical condition exerts the strongest positive influence on valuation, highlighting the critical role of ongoing maintenance and structural upkeep in sustaining asset value over time. Building age, while an unavoidable factor, does not act in isolation; its negative effect can be moderated through effective maintenance and adaptive reuse strategies. Usage category further differentiates valuation outcomes, with properties supporting diversified or intensive functions demonstrating higher composite scores. From a practical perspective, the framework offers a valuable tool for early-stage decision-making in property management, urban planning, and investment screening, particularly in contexts where detailed market data are unavailable or unreliable. Local authorities can apply the model to support taxation equity and asset prioritization, while engineers and facility managers may use it to benchmark building performance and identify intervention needs. Small-scale investors and developers can employ the framework as an initial filter before undertaking detailed market-based appraisals. Integrating the framework with digital inspection tools and property databases could further enhance consistency and scalability. Overall, embedding simplicity, transparency, and adaptability within valuation practice can improve decision quality and promote more informed and sustainable management of the built environment.

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