

**MIDOCEAN UNIVERSITY**

**College of Management**

Department / Major: Real Estate Management

**Traditional Property Valuation vs. Automated Valuation Models (AVMs):**

**A Comparative Analysis of Performance and Valuation Quality.**

**Prepared by (Student):**

Osama Nofal

**Supervised by:**

Dr. Al-Faisal Abdul Hamid

Dr. Fayez Jarad

**Academic Year:**

2026

## Contents

|                                                                         |    |
|-------------------------------------------------------------------------|----|
| 1. Introduction .....                                                   | 5  |
| 1.1 General Overview of the Research Field.....                         | 5  |
| 1.2 Importance of the Topic in Global and Local Contexts .....          | 5  |
| 1.3 Identification of the Research Gap .....                            | 6  |
| 1.4 Overview of the Research Scope .....                                | 6  |
| 2. Research Problem .....                                               | 7  |
| 3. Importance of the Study .....                                        | 8  |
| A) Scientific Importance.....                                           | 8  |
| B) Practical Importance.....                                            | 8  |
| 4. Study Objectives .....                                               | 9  |
| General Objective .....                                                 | 9  |
| Specific Objectives .....                                               | 9  |
| 5. Research Questions.....                                              | 10 |
| 6. Study Hypotheses .....                                               | 11 |
| 6.1 Main Hypothesis .....                                               | 11 |
| 6.2 Sub-Hypotheses .....                                                | 11 |
| 6.2.1 Impact of AVMs on Valuation Accuracy.....                         | 11 |
| 6.2.2 Impact of AVMs on Valuation Efficiency.....                       | 11 |
| 6.2.3 Relationship Between Data Availability and AVM Performance .....  | 12 |
| 6.2.4 Integration of AVMs with Traditional Valuation Methods .....      | 12 |
| 7. Previous Studies.....                                                | 13 |
| 7.1 Kok, Koponen, and Martínez-Barbosa (2017).....                      | 13 |
| 7.2 International Association of Assessing Officers (IAAO) (2018) ..... | 14 |
| 7.3 Bergadano, Bertilone, Paolotti, and Ruffo (2019).....               | 14 |
| 7.4 Renigier-Bilozor, d'Amato, and Kauko (2019).....                    | 15 |
| 7.5 Băbțan (2020).....                                                  | 15 |
| 7.6 RICS Roadmap (2021).....                                            | 16 |

|                                                                             |    |
|-----------------------------------------------------------------------------|----|
| 7.7 RICS Insight Paper (2022) .....                                         | 16 |
| 7.8 International Valuation Standards Council (IVSC) (2022) .....           | 17 |
| 7.9 Jafari, Shojaei, Rajabifard, and Ngo (2024) .....                       | 17 |
| 7.10 Tapia, Chavez-Garzon, Pezoa, Suarez-Aldunate, and Pilleux (2025) ..... | 18 |
| 7.11 Analytical Comparison of Previous Studies.....                         | 19 |
| 7.12 Research Gap .....                                                     | 22 |
| 8. Theoretical Foundations of the Study.....                                | 23 |
| 8.1 Innovation Theory .....                                                 | 23 |
| 8.2 Resource-Based Theory .....                                             | 24 |
| 8.3 Information and Data-Driven Decision-Making Theory.....                 | 24 |
| 8.4 Application of Theoretical Framework in the Current Study .....         | 25 |
| 9. Methodology and Research Methods.....                                    | 26 |
| 9.1 Type of Research.....                                                   | 26 |
| 9.2 Research Approach .....                                                 | 26 |
| Qualitative Phase .....                                                     | 26 |
| Quantitative Phase.....                                                     | 26 |
| 9.3 Research Plan and Implementation Steps .....                            | 27 |
| 10. Study Tools.....                                                        | 28 |
| 10.1 Expert Interviews .....                                                | 28 |
| Development of the Interview Tool.....                                      | 28 |
| Testing the Interview Tool .....                                            | 28 |
| 10.2 Ready Automated Valuation Model (AVM) Platform .....                   | 29 |
| 10.3 Excel-Based AVM Valuation Calculator.....                              | 29 |
| Development of the Excel AVM Calculator.....                                | 29 |
| Testing and Validation of the Calculator.....                               | 30 |
| 10.4 Reliability and Validity of the Study Tools .....                      | 30 |
| 11. Study Limitations .....                                                 | 31 |
| A) Human Scope.....                                                         | 31 |

|                                       |    |
|---------------------------------------|----|
| Study Population.....                 | 31 |
| Study Sample.....                     | 31 |
| Sample Size and Selection Method..... | 31 |
| B) Spatial Scope.....                 | 31 |
| C) Temporal Scope .....               | 32 |
| Data Collection Period .....          | 32 |
| Study Period .....                    | 32 |
| 12. References .....                  | 33 |

## 1. Introduction

### 1.1 General Overview of the Research Field

Property valuation plays a fundamental role in the functioning of real estate markets. Accurate valuation is essential for investment decision-making, mortgage lending, taxation, urban planning, financial reporting, and risk management. Traditionally, property valuation has been conducted by professional valuers who rely on established appraisal methods such as the sales comparison approach, income capitalization approach, and cost approach. These approaches depend largely on the valuer's expertise, judgment, and interpretation of market data. While traditional valuation methods remain widely accepted and are supported by professional standards such as the RICS Global Red Book and International Valuation Standards (IVS), they can be time-consuming and sometimes subject to human bias or inconsistency.

In recent years, rapid developments in data science, artificial intelligence, and big data analytics have introduced new methods for property valuation. Among these innovations are Automated Valuation Models (AVMs), which use statistical modeling, machine learning algorithms, and large datasets to estimate property values automatically. AVMs analyze large volumes of property transactions, market trends, and spatial data to generate property value estimates quickly and consistently. These models are increasingly used by financial institutions, property portals, and government agencies to support valuation processes.

The integration of digital technologies in real estate markets has significantly transformed the way property data is collected, analyzed, and used. With the availability of large property datasets and advanced computational techniques, AVMs have become an important component of modern valuation practices. They are particularly valuable for large-scale valuation tasks such as mass appraisal, mortgage portfolio analysis, and real estate market monitoring.

However, despite the technological advantages of AVMs, their adoption raises several important questions regarding accuracy, transparency, reliability, and professional acceptance. While AVMs can process vast amounts of data efficiently, they may also face limitations related to data quality, model assumptions, and the inability to capture certain qualitative aspects of property value that experienced valuers consider during traditional appraisal.

### 1.2 Importance of the Topic in Global and Local Contexts

Globally, the real estate sector represents one of the largest asset classes in the world economy. Reliable property valuation is therefore critical for maintaining financial stability and supporting investment decisions. Following the global financial crisis of 2008, the importance of accurate and transparent property valuation became even more evident, particularly in relation to mortgage lending and financial risk management. In response, many institutions have explored the use of AVMs to enhance valuation efficiency and reduce operational costs.

International organizations and professional bodies, including the Royal Institution of Chartered Surveyors (RICS) and the International Association of Assessing Officers (IAAO), have increasingly recognized the role of automated valuation technologies in modern real estate markets. These organizations emphasize the need for proper governance, data quality, and methodological transparency when implementing AVMs.

At the regional level, the real estate markets of the Middle East and Gulf countries, including the United Arab Emirates, have experienced significant growth and digital transformation in recent years. Governments and real estate authorities are investing in smart city initiatives, digital property registries, and advanced real estate analytics platforms. These developments have created new opportunities for integrating AVMs into property valuation practices.

In markets such as Abu Dhabi and Dubai, where large volumes of property transactions occur annually, the ability to process and analyze property data efficiently is increasingly important. Automated valuation tools can support market transparency, improve decision-making, and enhance the efficiency of property valuation processes. However, the adoption of AVMs also requires careful evaluation to ensure that these models produce reliable results comparable to those generated by traditional valuation methods.

### 1.3 Identification of the Research Gap

Despite the growing interest in automated valuation technologies, there remains an ongoing debate within the valuation profession regarding the performance and reliability of AVMs compared to traditional valuation methods. While numerous studies have explored the development of automated valuation algorithms, fewer studies have focused on a comprehensive comparison between traditional property valuation practices and AVM-based valuation outcomes, particularly in terms of valuation accuracy, consistency, and practical usability.

Additionally, many existing studies have been conducted in mature real estate markets such as the United States and Europe. There is comparatively limited academic research examining the effectiveness of AVMs in emerging or rapidly developing real estate markets, including those in the Middle East. This creates a knowledge gap regarding the applicability and performance of AVMs in different market contexts.

Another gap lies in understanding how AVMs can complement, rather than replace, traditional valuation methods. Professional valuers possess contextual knowledge and qualitative insights that may not always be captured by automated models. Therefore, evaluating the strengths and limitations of both approaches is essential for developing a balanced valuation framework.

### 1.4 Overview of the Research Scope

This research aims to conduct a comparative analysis between traditional property valuation methods and Automated Valuation Models (AVMs) in order to evaluate their performance and valuation quality. The study will examine how each approach estimates property values and assess the accuracy and reliability of the resulting valuations.

The research will include the following key components:

1. A review of traditional property valuation methods and professional valuation standards.
2. An examination of the theoretical and technical foundations of Automated Valuation Models.
3. A comparative analysis of valuation results produced by traditional methods and AVMs.
4. An evaluation of the strengths and limitations of each approach in terms of accuracy, efficiency, transparency, and practical usability.

Recommendations for integrating automated valuation technologies into modern real estate valuation practices.

Through this analysis, the research seeks to provide a deeper understanding of the role that automated technologies can play in supporting professional property valuation while maintaining the reliability and integrity of valuation practices.

## 2. Research Problem

Property valuation is essential for ensuring transparency and stability in real estate markets. However, traditional valuation methods are often characterized by time-intensive procedures, reliance on expert judgment, and potential inconsistencies between valuers. At the same time, the increasing availability of property data and advancements in artificial intelligence have led to the development of Automated Valuation Models, which promise faster and more scalable valuation solutions.

Despite these technological advancements, there remains uncertainty regarding the accuracy and reliability of AVM estimates compared with traditional valuation methods. Professional valuers and financial institutions continue to debate whether automated models can achieve valuation quality comparable to that produced by experienced valuers.

The research problem can therefore be formulated through the following key questions:

1. How do Automated Valuation Models differ from traditional property valuation methods in terms of methodology and data usage?
2. To what extent do AVM-generated valuations match the results produced by traditional valuation approaches?
3. What are the strengths and limitations of Automated Valuation Models in estimating property values?
4. Can AVMs be used as a reliable tool to support or complement traditional property valuation practices?

The gap between the current situation and the desired situation lies in the need for valuation methods that are both accurate and efficient. While traditional methods provide professional judgment and contextual

understanding, they may lack scalability and speed. Conversely, AVMs offer rapid valuation capabilities but may struggle with complex or unique property characteristics.

Evidence of this problem can be observed in several industry reports and academic studies that highlight differences between automated and traditional valuation results. Research has shown that while AVMs can achieve high levels of statistical accuracy in data-rich environments, their performance may decline when property characteristics are unique or when market data is limited. This indicates the need for further research comparing these two approaches in order to determine how they can best be applied in modern real estate markets.

### 3. Importance of the Study

#### A) Scientific Importance

The scientific importance of this study lies in its contribution to the academic and professional understanding of modern property valuation methods. Specifically, the study aims to:

- Enrich theoretical knowledge in the field of real estate valuation and automated valuation technologies.
- Contribute to filling an existing gap in the academic literature concerning the comparative performance of traditional valuation methods and Automated Valuation Models.
- Provide an integrated theoretical framework that explains how automated technologies can be incorporated into valuation practices while maintaining professional standards and valuation reliability.

By examining both valuation approaches within a single analytical framework, the study will enhance academic discussion regarding the evolving role of technology in real estate valuation.

#### B) Practical Importance

In addition to its theoretical contributions, this study also has important practical implications for real estate professionals, financial institutions, and policymakers. The practical importance of the study includes:

- Providing recommendations that may help real estate institutions and valuation professionals understand how Automated Valuation Models can be integrated into their valuation processes.
- Assisting policymakers and regulatory authorities in developing guidelines for the responsible use of automated valuation technologies in real estate markets.
- Supporting the development of improved measurement and evaluation tools that combine the efficiency of automated models with the expertise of professional valuers.

Ultimately, the findings of this research may contribute to improving valuation practices by identifying the most effective ways to combine human expertise with advanced data-driven technologies.

## 4. Study Objectives

The objectives of this study are formulated to guide the research toward a clear and systematic comparison between traditional property valuation methods and Automated Valuation Models (AVMs). These objectives aim to examine how technological advancements in valuation methods influence the accuracy, efficiency, and overall quality of property valuation outcomes. Establishing clear and achievable objectives ensures that the research remains focused on addressing the research problem and contributes meaningful insights to the field of real estate valuation (RICS, 2022; IAAO, 2018).

The objectives of the study are divided into general objectives and specific objectives, as outlined below.

### General Objective

To analyze the impact of Automated Valuation Models (AVMs) on property valuation practices and to compare their performance with traditional property valuation methods in order to evaluate valuation accuracy, efficiency, and overall valuation quality in real estate markets.

### Specific Objectives

1. Identify the main methodologies used in traditional property valuation and examine the techniques applied in Automated Valuation Models for estimating property values.
2. Measure the impact of automated valuation techniques on the accuracy and efficiency of property valuation, compared with traditional appraisal approaches.
3. Evaluate the technological, data-related, and methodological challenges associated with implementing Automated Valuation Models in real estate valuation practices.
4. Propose a conceptual framework for integrating Automated Valuation Models with traditional valuation methods, in order to improve valuation reliability and support decision-making in real estate markets.

## 5. Research Questions

Research questions are formulated to guide the study toward addressing the research problem in a structured and systematic manner. They represent the key issues that the research seeks to investigate and provide a clear direction for the analysis and interpretation of results. Well-designed research questions must be specific, logically connected to the study objectives, and capable of being answered through empirical investigation and analytical methods. In this study, the research questions are developed to explore the relationship between traditional property valuation methods and Automated Valuation Models (AVMs) and to evaluate their performance and applicability within real estate markets.

The research questions are aligned with the objectives of the study and aim to cover the main aspects of the comparative analysis between traditional valuation approaches and automated valuation technologies.

The study will address the following research questions:

1. What are the main methodologies and principles used in traditional property valuation methods compared with those applied in Automated Valuation Models (AVMs)?
2. How does the use of Automated Valuation Models influence the accuracy and efficiency of property valuation compared with traditional appraisal methods?
3. What technological, data-related, and methodological challenges affect the implementation of Automated Valuation Models in real estate valuation practices?
4. What is the relationship between automated valuation techniques and the quality and reliability of property valuation results in real estate markets?
5. How can Automated Valuation Models be effectively integrated with traditional valuation methods to improve property valuation practices and support decision-making in the real estate sector?

These research questions collectively aim to provide a comprehensive understanding of the potential role of automated valuation technologies in modern real estate valuation and to determine whether they can complement or enhance traditional valuation practices.

## 6. Study Hypotheses

Research hypotheses represent proposed relationships between variables that can be empirically tested using statistical methods. In quantitative research, hypotheses are formulated to examine whether a statistically significant relationship exists between the variables under investigation. Hypotheses are generally presented in two forms: the alternative hypothesis (H1), which assumes that a significant relationship exists, and the null hypothesis (H0), which assumes that no significant relationship exists.

In this study, the hypotheses are formulated to test the relationship between Automated Valuation Models (AVMs) and traditional property valuation methods in terms of valuation accuracy, efficiency, and overall valuation reliability.

### 6.1 Main Hypothesis

H1:

There is a statistically significant difference between Automated Valuation Models (AVMs) and traditional property valuation methods in terms of valuation accuracy and efficiency.

H0:

There is no statistically significant difference between Automated Valuation Models (AVMs) and traditional property valuation methods in terms of valuation accuracy and efficiency.

### 6.2 Sub-Hypotheses

#### 6.2.1 Impact of AVMs on Valuation Accuracy

H1.1:

The use of Automated Valuation Models has a statistically significant effect on improving the accuracy of property valuation compared with traditional valuation methods.

H0.1:

The use of Automated Valuation Models has no statistically significant effect on the accuracy of property valuation compared with traditional valuation methods.

#### 6.2.2 Impact of AVMs on Valuation Efficiency

H1.2:

Automated Valuation Models significantly improve the efficiency and speed of property valuation processes compared with traditional appraisal methods.

H0.2:

Automated Valuation Models do not significantly improve the efficiency and speed of property valuation processes compared with traditional appraisal methods.

### 6.2.3 Relationship Between Data Availability and AVM Performance

H1.3:

There is a statistically significant relationship between the availability and quality of real estate data and the performance accuracy of Automated Valuation Models.

H0.3:

There is no statistically significant relationship between the availability and quality of real estate data and the performance accuracy of Automated Valuation Models.

### 6.2.4 Integration of AVMs with Traditional Valuation Methods

H1.4:

Integrating Automated Valuation Models with traditional valuation methods significantly improves the overall reliability of property valuation results.

H0.4:

Integrating Automated Valuation Models with traditional valuation methods does not significantly improve the overall reliability of property valuation results.

## 7. Previous Studies

Previous studies related to property valuation and Automated Valuation Models (AVMs) have increased significantly with the advancement of big data, machine learning, and digital real estate systems. In this research, the studies are organized in chronological order from oldest to newest, as this method clearly shows the development of the field over time, beginning with general discussions of automation and moving toward more advanced comparative and AI-based valuation models.

### 7.1 Kok, Koponen, and Martínez-Barbosa (2017)

#### **Full Reference**

Kok, N., Koponen, E., & Martínez-Barbosa, C. A. (2017). Big data in real estate? From manual appraisal to automated valuation. *Journal of Portfolio Management*, 43(6), 202–211.

#### **Study Objective**

This study aimed to examine how big data is transforming the real estate sector, particularly the shift from traditional manual appraisal toward automated valuation systems.

#### **Research Methodology**

The study used an analytical approach supported by discussion of large real estate datasets and valuation applications. It focused on the role of data-driven models in real estate decision-making and valuation practice.

#### **Key Findings**

The study found that AVMs can improve valuation speed, consistency, and scalability, especially in data-rich environments. However, it also emphasized that professional judgment remains important in cases involving complex or unique properties.

#### **Relation to the Current Research**

This study is highly relevant because it introduces the broader transformation from traditional valuation to automated valuation, which is the core issue examined in the current research.

## 7.2 International Association of Assessing Officers (IAAO) (2018)

### Full Reference

International Association of Assessing Officers (IAAO). (2018). *Standard on Automated Valuation Models (AVMs)*. Kansas City, MO: IAAO.

### Study Objective

The objective of this publication was to establish standards and professional guidance for the design, development, testing, and use of AVMs in property valuation and mass appraisal.

### Research Methodology

The study adopted a standards-based and professional practice approach. It reviewed valuation procedures, model development requirements, validation principles, and data quality considerations.

### Key Findings

The publication concluded that AVMs can provide efficient and consistent valuation outcomes, particularly for mass appraisal purposes, but their reliability depends on proper calibration, validation, and the quality of underlying data.

### Relation to the Current Research

This study provides a professional framework for evaluating AVM use and directly supports the current study's focus on valuation quality, reliability, and methodological comparison.

## 7.3 Bergadano, Bertilone, Paolotti, and Ruffo (2019)

### Full Reference

Bergadano, F., Bertilone, R., Paolotti, D., & Ruffo, G. (2019). *Learning real estate automated valuation models from heterogeneous data sources*. arXiv preprint arXiv:1909.00704.

### Study Objective

This study aimed to develop an AVM using heterogeneous data sources and machine learning techniques in order to improve the speed and precision of real estate appraisal.

### Research Methodology

The researchers used a machine learning approach based on multiple data sources, including previous appraisal documents, web-crawled property advertisements, and open geographic data. The case study was applied to housing data from Turin, Italy.

### Key Findings

The study found that combining heterogeneous data sources can strengthen automated valuation

performance and improve practical applicability. It also showed that automated models can reduce dependence on manually collected information in some valuation contexts.

#### **Relation to the Current Research**

This study is important because it demonstrates how AVM performance can be enhanced through richer and more diverse datasets, which is directly related to the current study's examination of valuation quality and accuracy.

#### **7.4 Renigier-Bițozor, d'Amato, and Kauko (2019)**

##### **Full Reference**

Renigier-Bițozor, M., d'Amato, M., & Kauko, T. (2019). *Automated valuation models (AVMs): A review of the literature. Real Estate Management and Valuation*, 27(3), 1–13.

##### **Study Objective**

The aim of this study was to review the academic development of AVMs and analyze the methodologies used in automated property valuation.

##### **Research Methodology**

The study adopted a literature review methodology, examining prior research on hedonic pricing, statistical models, and automated valuation techniques.

##### **Key Findings**

The study found that AVMs have developed from traditional statistical methods into more advanced machine learning-based systems. At the same time, it concluded that AVM performance depends greatly on market data quality, model specification, and the context in which the model is applied.

#### **Relation to the Current Research**

This study provides theoretical support for the current research and confirms that AVMs should be evaluated not only as technical tools but also in relation to their practical valuation performance.

#### **7.5 Băbțan (2020)**

##### **Full Reference**

Băbțan, S.-I. (2020). *Automated valuation model for residential real estates*. EasyChair Preprint No. 2780.

##### **Study Objective**

This study aimed to explain the concept of AVMs and explore the possibility of applying an automated valuation technique in the residential real estate market of Cluj-Napoca, Romania.

##### **Research Methodology**

The study used an applied and conceptual methodology. It focused on building an algorithm through software tools to simplify the valuation process for residential properties.

**Key Findings**

The study found that AVMs can simplify and accelerate the valuation process, especially where sufficient market data is available. It also highlighted the growing importance of transparency, regulation, and automation in valuation services.

**Relation to the Current Research**

This study supports the practical side of the current research by showing how AVMs can be implemented in real market settings, while also reinforcing the need to compare their outputs with conventional valuation methods.

### 7.6 RICS Roadmap (2021)

**Full Reference**

Royal Institution of Chartered Surveyors (RICS). (2021). *Automated Valuation Models: Roadmap for RICS Members and Stakeholders*.

**Study Objective**

This roadmap aimed to guide RICS members and stakeholders in understanding the development, opportunities, risks, and professional implications of AVMs.

**Research Methodology**

The document used a professional and policy-based analytical approach. It discussed industry developments, governance requirements, and the responsible adoption of automated valuation systems.

**Key Findings**

The roadmap emphasized that AVMs are becoming increasingly important in the valuation profession, but their use must be accompanied by appropriate governance, transparency, data controls, and professional oversight.

**Relation to the Current Research**

This publication is relevant because it bridges the gap between theory and professional practice and supports the current study's concern with how AVMs can be integrated into valuation work without undermining reliability or standards.

### 7.7 RICS Insight Paper (2022)

**Full Reference**

Royal Institution of Chartered Surveyors (RICS). (2022). *Automated valuation models (AVMs): Implications for the profession and their clients*.

**Study Objective**

This study aimed to examine the implications of AVMs for valuation professionals and their clients, with particular emphasis on how these models affect valuation practice and service delivery.

**Research Methodology**

The paper used an analytical and professional guidance approach, discussing market trends, professional expectations, and operational implications of automated valuation.

**Key Findings**

The study concluded that AVMs can deliver faster and more efficient valuation outputs, but their adoption raises issues relating to accountability, trust, professional roles, and the limits of algorithmic valuation.

**Relation to the Current Research**

This study strongly supports the present research because it highlights the practical tension between efficiency and valuation quality, which is central to the comparison between traditional valuation and AVMs.

### 7.8 International Valuation Standards Council (IVSC) (2022)

**Full Reference**

International Valuation Standards Council (IVSC). (2022). *Automated Valuation Models: Perspectives Paper*.

**Study Objective**

The study aimed to assess the role of AVMs in global valuation practice and examine how they affect professional valuation standards and market participants.

**Research Methodology**

The paper adopted an analytical and policy-oriented approach, focusing on valuation governance, professional practice, and the increasing use of AVMs by financial institutions and real estate platforms.

**Key Findings**

The paper found that AVMs are increasingly used because of their efficiency and scalability, but also stressed that they should support rather than completely replace professional judgment.

**Relation to the Current Research**

This study is highly relevant because it directly supports the current research argument that AVMs should be evaluated not only in terms of speed, but also in relation to valuation quality and professional applicability.

### 7.9 Jafary, Shojaei, Rajabifard, and Ngo (2024)

**Full Reference**

Jafary, P., Shojaei, D., Rajabifard, A., & Ngo, T. (2024). *Automated land valuation models: A comparative study of four machine learning and deep learning methods based on a comprehensive range of influential factors*. *Cities*, 151, 105115.

**Study Objective**

This study aimed to develop and compare four AVMs for land valuation using machine learning and deep

learning methods and a broad range of physical, geographic, socio-economic, environmental, legal, and planning variables.

### Research Methodology

The researchers conducted a comparative empirical study in Melbourne Metropolitan, Australia. They tested four models: Support Vector Regression (SVR), Random Forest, Deep Neural Network (DNN), and eXtreme Gradient Boosting (XGBoost).

### Key Findings

The study found that XGBoost outperformed the other tested models and achieved high valuation accuracy. It also showed that valuation performance improves when a wide range of influential factors is incorporated and when feature selection and parameter tuning are carefully applied.

### Relation to the Current Research

This study is directly relevant because it provides recent empirical evidence on AVM accuracy and confirms that model performance depends not only on algorithm choice but also on variable selection and data quality.

## 7.10 Tapia, Chavez-Garzon, Pezoa, Suarez-Aldunate, and Pilleux (2025)

### Full Reference

Tapia, J., Chavez-Garzon, N., Pezoa, R., Suarez-Aldunate, P., & Pilleux, M. (2025). *Comparing automated valuation models for real estate assessment in the Santiago Metropolitan Region: A study on machine learning algorithms and hedonic pricing with spatial adjustments*. *PLOS ONE*, 20(3), e0318701.

### Study Objective

This study aimed to compare the precision and interpretability of two AVM approaches for residential real estate assessment: machine learning algorithms and hedonic pricing models with spatial adjustments.

### Research Methodology

The study used a comparative quantitative design in the Santiago Metropolitan Region of Chile. It combined traditional housing attributes with image-based variables extracted using convolutional neural networks and analyzed model behavior using SHAP.

### Key Findings

The study found that image-based variables improved model performance and reduced error margins. It also showed that important valuation factors included total surface area, municipality quality, school quality, and number of bathrooms, while advanced interpretability methods helped explain complex nonlinear relationships.

### Relation to the Current Research

This study is particularly useful because it presents a recent and advanced comparison of AVM methods and

demonstrates that modern automated valuation models are becoming both more accurate and more interpretable.

### 7.11 Analytical Comparison of Previous Studies

A critical review of the previous studies shows several important patterns. First, there is broad agreement that AVMs improve valuation speed, scalability, and consistency, especially where large and reliable datasets are available. This finding appears consistently across the studies from 2017 to 2025.

Second, the studies differ in methodology. Some used professional and standards-based approaches such as IAAO, RICS, and IVSC publications, while others relied on empirical model testing using machine learning, hedonic pricing, or comparative predictive techniques. These methodological differences explain why some studies focused on governance and professional limitations, whereas others emphasized predictive performance.

Third, more recent studies show a clear shift from general automated valuation concepts toward advanced AI-driven methods, including gradient boosting, deep learning, spatial models, and image-based variables. This indicates that the field is evolving quickly and that AVMs are becoming more sophisticated than earlier generations of statistical valuation tools.

At the same time, the reviewed studies consistently indicate that AVMs still face limitations. These include data quality problems, lack of transparency in some models, reduced ability to capture qualitative market features, and the continuing need for professional oversight in complex valuation situations.

The below table shows the full comparison between the previous studies with the relation with current study.

| Author(s)                         | Year | Study Objective                                                                                               | Methodology                                         | Key Findings                                                                                                | Relation to Current Research                                                                           |
|-----------------------------------|------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Kok, Koponen & Martínez-Barbosa   | 2017 | Examine the role of big data in transforming real estate valuation from manual appraisal to automated systems | Analytical review supported by real estate datasets | AVMs improve valuation speed and consistency but still require professional judgment for complex properties | Highlights the shift from traditional valuation to automated models, which is central to this research |
| IAAO                              | 2018 | Establish standards for the development and application of Automated Valuation Models                         | Professional standards and analytical review        | AVMs can enhance efficiency of valuation but require high-quality data and proper validation                | Provides professional guidelines for evaluating AVMs compared with traditional valuation               |
| Bergadano et al.                  | 2019 | Develop an AVM using heterogeneous data sources for real estate appraisal                                     | Machine learning model using multiple datasets      | Combining diverse datasets improves automated valuation performance                                         | Demonstrates how advanced data sources enhance AVM accuracy                                            |
| Renigier-Bitozor, d'Amato & Kauko | 2019 | Review the development and methodologies of AVMs                                                              | Systematic literature review                        | AVMs evolved from statistical models to machine learning techniques; accuracy depends on data quality       | Provides theoretical background supporting comparative evaluation of AVMs                              |
| Băbțan                            | 2020 | Develop an AVM for residential real estate markets                                                            | Applied conceptual model using valuation algorithms | AVMs simplify valuation procedures and improve efficiency in property appraisal                             | Shows practical application of AVMs in residential markets                                             |
| RICS                              | 2021 | Provide guidance on the professional use of AVMs                                                              | Professional policy and analytical framework        | AVMs are useful tools but must operate under governance and professional oversight                          | Supports integration of AVMs with professional valuation practice                                      |
| RICS                              | 2022 | Examine implications of AVMs for valuation professionals and clients                                          | Analytical industry report                          | AVMs provide efficiency but raise issues of accountability and transparency                                 | Highlights practical challenges of adopting AVMs                                                       |

| Author(s)     | Year | Study Objective                                                       | Methodology                                                            | Key Findings                                                                 | Relation to Current Research                                                              |
|---------------|------|-----------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| IVSC          | 2022 | Analyze the role of AVMs in global valuation practice                 | Policy-based analytical study                                          | AVMs should complement professional valuation rather than replace it         | Supports balanced integration of automated and traditional valuation                      |
| Jafary et al. | 2024 | Compare machine learning models for automated land valuation          | Comparative empirical analysis using ML models                         | XGBoost achieved the highest accuracy among tested models                    | Demonstrates recent improvements in AVM predictive performance                            |
| Tapia et al.  | 2025 | Compare machine learning and hedonic models for real estate valuation | Quantitative study using ML, spatial models, and image-based variables | Image-based features improved prediction accuracy and model interpretability | Shows recent technological developments in AVMs and supports further comparative research |

### 7.12 Research Gap

Based on the critical analysis of the previous studies, the following research gaps can be identified:

1. Many previous studies focused on developing or improving AVM techniques, but fewer studies provided a balanced comparison between traditional property valuation methods and AVMs from both technical and professional perspectives.
2. A large share of the literature concentrated on automated model performance, while less attention was given to the broader issue of valuation quality, including reliability, interpretability, and practical usability in professional contexts.
3. Previous studies often examined either technical model accuracy or professional standards and guidance, but fewer studies connected these two dimensions within one comparative research framework.
4. The rapid development of AI-based valuation techniques means that the relationship between human valuation judgment and automated systems remains an open area requiring further academic investigation.

Accordingly, the current study seeks to fill this gap by conducting a comparative analysis of traditional property valuation methods and Automated Valuation Models, with emphasis on valuation accuracy, efficiency, and overall valuation quality.

## 8. Theoretical Foundations of the Study

The theoretical foundations of a study provide the conceptual framework that explains the relationships between the variables under investigation and guides the interpretation of the research results. In the context of real estate valuation, the development of Automated Valuation Models (AVMs) and their comparison with traditional property valuation methods can be understood through several relevant theoretical perspectives. These theories help explain how technological innovation, data resources, and decision-making processes influence the effectiveness of valuation practices.

In this study, the theoretical framework is primarily based on three key theoretical perspectives: Innovation Theory, Resource-Based Theory, and Information and Data-Driven Decision-Making Theory. These theories collectively provide a comprehensive framework for understanding the transformation of traditional property valuation practices through the adoption of automated and data-driven valuation technologies.

### 8.1 Innovation Theory

Innovation Theory explains how new technologies and methods are introduced, adopted, and diffused within industries and organizations. According to innovation theory, technological advancements can significantly improve efficiency, productivity, and the quality of decision-making processes in various sectors, including real estate. The adoption of new technologies often leads to changes in traditional practices and the emergence of more advanced operational models.

In the context of property valuation, Automated Valuation Models represent a major technological innovation. AVMs apply statistical models, machine learning algorithms, and large datasets to estimate property values more rapidly and consistently than traditional manual appraisal methods. The emergence of these models reflects the broader digital transformation occurring within the real estate industry, where data analytics and artificial intelligence are increasingly used to support decision-making processes.

Innovation theory suggests that organizations and professionals adopt new technologies when they perceive clear benefits such as improved efficiency, reduced costs, and enhanced performance. However, the adoption of innovation may also face resistance due to concerns related to reliability, transparency, and compatibility with existing professional standards. In the context of this study, innovation theory helps explain the gradual adoption of AVMs in the valuation profession and the ongoing debate regarding their effectiveness compared with traditional valuation methods.

Within the current research, innovation theory is applied to examine how automated valuation technologies represent an innovative transformation of traditional property valuation practices, and to evaluate whether this innovation improves valuation performance and efficiency.

## 8.2 Resource-Based Theory

Resource-Based Theory (RBT) focuses on how organizations gain competitive advantages through the effective utilization of valuable resources and capabilities. According to this theory, organizations that possess unique and valuable resources are more capable of achieving superior performance compared with their competitors.

In the context of real estate valuation, one of the most important strategic resources is data. High-quality property transaction data, geographic information, and market indicators provide the foundation for both traditional valuation methods and automated valuation models. However, AVMs rely heavily on the availability of large and reliable datasets in order to generate accurate valuation estimates.

Resource-Based Theory suggests that organizations with access to comprehensive real estate datasets, advanced analytical tools, and technological capabilities are better positioned to develop effective automated valuation systems. These resources enable them to analyze large volumes of property information and generate reliable valuation outputs more efficiently.

In the present study, Resource-Based Theory is applied to understand how data availability and technological capabilities influence the performance of Automated Valuation Models. It also helps explain why AVM performance may vary across different real estate markets depending on the quality and accessibility of property data.

## 8.3 Information and Data-Driven Decision-Making Theory

Information and Data-Driven Decision-Making Theory emphasizes the role of information systems and data analytics in improving decision-making processes. According to this theoretical perspective, organizations can make more accurate and informed decisions when they rely on systematic data analysis rather than solely on subjective judgment.

In the real estate sector, property valuation has traditionally relied on professional expertise and market knowledge. While these factors remain important, modern valuation practices increasingly incorporate data analytics and automated systems to enhance decision-making accuracy. Automated Valuation Models represent an example of data-driven decision-making tools that process large volumes of property information in order to generate value estimates.

The application of this theory suggests that valuation outcomes may become more consistent and objective when supported by structured datasets and analytical models. However, it also highlights the importance of balancing data-driven analysis with professional judgment, particularly in cases where qualitative market factors play a significant role.

In this research, the theory of data-driven decision-making is used to explain how AVMs support valuation decisions through advanced data analysis, and how their performance compares with traditional valuation methods that rely more heavily on human expertise.

#### 8.4 Application of Theoretical Framework in the Current Study

The three theoretical perspectives discussed above provide the conceptual foundation for this research. Innovation Theory explains the emergence of Automated Valuation Models as a technological innovation within the real estate sector. Resource-Based Theory highlights the importance of data availability and technological capabilities in determining the effectiveness of automated valuation systems. Finally, Data-Driven Decision-Making Theory emphasizes the role of information and analytics in improving valuation outcomes.

By integrating these theoretical perspectives, the study develops a framework for analyzing the relationship between valuation methodology (traditional vs. automated), data resources, and valuation performance. This framework supports the comparative analysis conducted in the research and helps explain the potential benefits and limitations of Automated Valuation Models in modern real estate valuation practices.

## 9. Methodology and Research Methods

The methodology section explains the research design and the procedures used to collect and analyze data to answer the research questions and test the study hypotheses. It describes the type of research, the research approach, and the practical steps followed to implement the study. Selecting an appropriate methodology is essential to ensure that the research results are reliable and scientifically valid.

In this study, the methodology is designed to evaluate the performance of Automated Valuation Models (AVMs) compared with traditional property valuation methods, focusing on valuation accuracy, efficiency, and reliability.

### 9.1 Type of Research

This research can be classified as applied and explanatory research.

First, applied research is considered because it aims to address a practical problem in the real estate sector, namely the evaluation of automated valuation technologies and their potential use in professional property valuation practices. The results of the study are expected to provide recommendations that can assist real estate professionals, financial institutions, and policymakers in improving valuation processes.

Second, the study is also explanatory research, as it seeks to explain the relationship between the valuation method used (traditional valuation versus automated valuation models) and the resulting valuation accuracy and efficiency. The research attempts to identify whether the adoption of automated valuation technologies significantly influences valuation performance.

### 9.2 Research Approach

The study adopts a mixed-methods research approach, combining both qualitative and quantitative techniques to provide a comprehensive understanding of the research problem.

#### Qualitative Phase

The qualitative phase aims to explore professional perspectives on Automated Valuation Models and their role in property valuation practice. This phase may include interviews or expert consultations with valuation professionals, real estate analysts, or industry specialists in order to understand the challenges, opportunities, and limitations associated with the adoption of AVMs.

The qualitative findings will help identify the main factors influencing the use of automated valuation technologies and provide contextual insights that support the interpretation of quantitative results.

#### Quantitative Phase

The quantitative phase focuses on measuring and comparing the performance of traditional valuation methods and Automated Valuation Models. This phase may involve the use of property transaction data,

valuation datasets, or survey questionnaires to analyze the relationship between valuation methods and valuation outcomes.

Statistical analysis techniques may be used to evaluate the hypotheses of the study and determine whether significant differences exist between the two valuation approaches in terms of accuracy, efficiency, and reliability.

### 9.3 Research Plan and Implementation Steps

The research will be conducted through a series of systematic steps designed to ensure a structured and rigorous analysis. These steps include the following:

1. Literature Review  
Reviewing academic studies, professional reports, and valuation standards related to property valuation methods and Automated Valuation Models.
2. Development of Theoretical Framework  
Establishing the conceptual framework of the study based on relevant theories such as innovation theory and data-driven decision-making.
3. Data Collection  
Collecting the necessary data through qualitative interviews, expert opinions, and quantitative datasets related to property valuation.
4. Data Analysis  
Applying appropriate analytical methods to evaluate the performance of traditional valuation methods and automated valuation models.
5. Comparison of Valuation Results  
Conducting a comparative analysis to determine differences in valuation accuracy, efficiency, and reliability between the two valuation approaches.
6. Interpretation of Results  
Interpreting the findings in relation to the research questions, hypotheses, and theoretical framework of the study.
7. Development of Recommendations  
Providing practical recommendations for improving valuation practices and integrating automated valuation technologies within the real estate sector.

## 10. Study Tools

Study tools represent the instruments used to collect and analyze the data necessary to address the research questions and test the study hypotheses. Selecting appropriate research tools is essential to ensure that the collected data is reliable and that the research findings are scientifically valid.

In this study, multiple data collection and analysis tools are used in order to evaluate the performance of traditional property valuation methods and Automated Valuation Models (AVMs). These tools include expert interviews, a ready Automated Valuation Model platform used as a reference example, and an Excel-based AVM calculator developed for the purpose of the empirical analysis.

### 10.1 Expert Interviews

Expert interviews are used as a qualitative tool to collect professional insights from specialists working in property valuation, real estate analysis, or related fields. The purpose of these interviews is to understand the practical perspectives of professionals regarding the use of Automated Valuation Models, including their advantages, limitations, and potential role in supporting traditional valuation practices.

#### Development of the Interview Tool

The interview questions were developed based on the research objectives, research questions, and theoretical framework of the study. The interview guide focuses on several key topics, including:

- Current practices used in property valuation.
- The perceived advantages and limitations of Automated Valuation Models.
- The challenges are associated with implementing automated valuation technologies.
- The potential integration of AVMs with traditional valuation methods.

The interview tool consists of semi-structured questions, allowing respondents to provide detailed explanations while ensuring that the collected information remains comparable across all interviews.

#### Testing the Interview Tool

Before conducting the interviews, the interview guide may be reviewed by experts in real estate valuation or academic supervisors to ensure that the questions are clear, relevant, and aligned with the objectives of the study. Feedback from this review process helps refine the interview questions and improve the reliability of the qualitative data collected.

## 10.2 Ready Automated Valuation Model (AVM) Platform

In addition to the research tools developed for this study, the research also reviews existing Automated Valuation Model platforms used in real estate markets. One example is the Bayut TruEstimate™ property valuation tool, which provides automated property value estimates based on artificial intelligence and real estate market data.

TruEstimate™ is an AI-powered valuation platform that analyzes property information, including location, property characteristics, and market transaction data, to generate estimated property values. The system integrates real estate data sources such as property listings and official market transaction data in order to produce automated valuation reports.

The platform provides several indicators that help users understand property value, including:

- Estimated market value of the property
- Comparable properties in the same area
- Price per square foot
- Historical price trends
- Rental yield indicators

Although the TruEstimate platform is not directly used as the main analytical tool in this study, it serves as a reference example of a real-world Automated Valuation Model currently applied in real estate markets. Examining such platforms helps illustrate how AVM technologies are implemented in practice and provides context for the comparison between automated valuation tools and traditional appraisal methods.

## 10.3 Excel-Based AVM Valuation Calculator

The primary quantitative tool used in this study is an Excel-based Automated Valuation Model calculator, developed specifically for research purposes. This tool is designed to estimate property values using statistical relationships between property characteristics and market transaction prices.

### Development of the Excel AVM Calculator

The Excel AVM calculator uses property data such as:

- Property location
- Property size
- Property type
- Property characteristics
- Historical transaction prices
- Market indicators

Using Microsoft Excel functions and statistical formulas, the calculator processes these input variables to generate estimated property values. This simplified AVM structure allows the researcher to simulate automated valuation outputs and compare them with traditional valuation estimates.

#### Testing and Validation of the Calculator

The Excel AVM calculator will be tested using a sample of property transaction data. The estimated values generated by the calculator will be compared with actual market prices and traditional valuation results. This comparison allows the researcher to measure the accuracy and reliability of the automated valuation model.

The use of an Excel-based AVM also provides transparency in the valuation process, as all calculations and variables can be clearly observed and analyzed.

#### 10.4 Reliability and Validity of the Study Tools

Ensuring the reliability and validity of the study tools is an important step in the research process. Reliability refers to the consistency of the results produced by the research tools, while validity refers to the extent to which the tools accurately measure the intended variables.

In this study, reliability and validity will be ensured through several procedures, including:

- Reviewing the interview questions with experts in real estate valuation.
- Testing the Excel-based AVM calculator using real property market data.
- Verifying the accuracy and consistency of the datasets used in the analysis.
- Applying appropriate statistical techniques to evaluate valuation results.

These procedures help ensure that the research tools provide reliable data that supports the objectives of the study and leads to credible research conclusions.

## 11. Study Limitations

Every research study operates within certain boundaries that define the scope of the research and clarify the context in which the results should be interpreted. These limitations help identify the population being studied, the geographical area covered, and the period during which the research is conducted.

In the present study, the limitations are defined through human scope, spatial scope, and temporal scope, as described below.

### A) Human Scope

The human scope refers to the group of individuals or entities from which the study data is collected.

#### Study Population

The study population consists of professionals and stakeholders involved in property valuation and real estate analysis, including property valuers, real estate analysts, and professionals working in real estate institutions or valuation-related fields.

#### Study Sample

The study sample includes a selected group of real estate valuation professionals and industry experts who have experience with property valuation practices or automated valuation technologies. These participants provide qualitative insights regarding the advantages, challenges, and practical use of Automated Valuation Models.

#### Sample Size and Selection Method

The sample will be selected using a purposive sampling method, where participants are chosen based on their professional expertise and experience in property valuation or real estate analytics. This approach ensures that the collected data reflects informed professional perspectives relevant to the objectives of the study.

### B) Spatial Scope

The spatial scope refers to the geographical area in which the study is conducted.

In this research, the study focuses primarily on real estate markets in the United Arab Emirates, particularly markets where digital real estate data and automated valuation tools are increasingly used. The study also reviews examples of automated valuation platforms operating in the region, such as Bayut TruEstimate, which provides AI-based property valuation estimates using market data from Dubai.

While the research focuses mainly on the UAE real estate market, the findings may also contribute to understanding the broader application of Automated Valuation Models in other real estate markets with similar data environments.

### C) Temporal Scope

The temporal scope refers to the time period during which the data used in the study is collected and analyzed.

#### Data Collection Period

The data collection process for this research is conducted during the year 2024, including interviews with professionals and the collection of relevant property data used in the valuation analysis.

#### Study Period

The overall study covers the period 2023–2024, during which the literature review, theoretical framework development, data collection, and analysis of valuation methods are conducted.

## 12. References

- Băbțan, S.-I. (2020). Automated valuation model for residential real estates. EasyChair Preprint No. 2780.
- Bayut. (2024). TruEstimate™ property valuation tool. Retrieved from <https://www.bayut.com/property-market-analysis/tru-estimate/>
- Bergadano, F., Bertilone, R., Paolotti, D., & Ruffo, G. (2019). Learning real estate automated valuation models from heterogeneous data sources. arXiv preprint arXiv:1909.00704.
- International Association of Assessing Officers (IAAO). (2018). Standard on Automated Valuation Models (AVMs). Kansas City, MO: IAAO.
- International Valuation Standards Council (IVSC). (2022). Automated valuation models: Perspectives paper. London: IVSC.
- International Valuation Standards Council (IVSC). (2022). Automated valuation models: Perspectives paper (print edition). London: IVSC.
- Jafary, P., Shojaei, D., Rajabifard, A., & Ngo, T. (2024). Automated land valuation models: A comparative study of machine learning and deep learning methods based on influential factors. *Cities*, 151, 105115.
- Kok, N., Koponen, E., & Martínez-Barbosa, C. A. (2017). Big data in real estate? From manual appraisal to automated valuation. *Journal of Portfolio Management*, 43(6), 202–211.
- Renigier-Bițozor, M., Ache, P., et al. (2019). Automated valuation models in real estate appraisal: Methodological developments and practical implications. FIG Working Week Conference Proceedings.
- Royal Institution of Chartered Surveyors (RICS). (2021). Automated valuation models: Roadmap for RICS members and stakeholders. London: RICS.
- Royal Institution of Chartered Surveyors (RICS). (2022). RICS valuation – Global standards (Red Book). London: RICS.
- Royal Institution of Chartered Surveyors (RICS). (2022). RICS valuation – Global standards (Arabic translation). London: RICS.
- Royal Institution of Chartered Surveyors (RICS). (2022). Automated valuation models: Industry insights report. London: RICS.
- Tapia, J., Chavez-Garzon, N., Pezoa, R., Suarez-Aldunate, P., & Pilleux, M. (2025). Comparing automated valuation models for real estate assessment in the Santiago Metropolitan Region using machine learning algorithms and hedonic pricing. *PLOS ONE*, 20(3), e0318701.